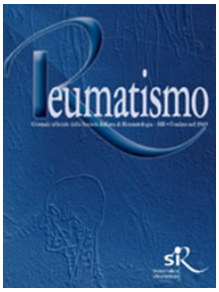

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Factors associated with life quality, sleep quality, and depression in systemic sclerosis patients: a cross-sectional study from Iran

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Summary

Objective. This study aimed to determine the prevalence and associated factors of depressive symptoms, poor sleep, and life quality among patients with systemic sclerosis (SSc).

Methods. This was a cross-sectional study including 120 SSc patients. Demographic and clinical data were obtained. The Short Form Health Survey 36 (SF-36), Pittsburgh Sleep Quality Index (PSQI), and short form of the Beck Depression Questionnaire were used to evaluate life quality, sleep quality, and self-reported depressive symptoms, respectively. The obtained data were analyzed to identify the demographic and clinical risk associations for depressive symptoms, poor sleep, and life quality.

Results. Of 120 participants, 108 patients (90%) were female. The mean age was 42.23 years, and the mean disease duration was 13.58 years. Most of the patients were married, unemployed, or housekeepers. Most of them had moderate economic conditions and tertiary education. The total scores of the SF-36 and PSQI questionnaires were 93.25±3.7 and 9.02±4.51, respectively, which showed good life quality but poor sleep quality. The prevalence of depressive symptoms was 44.16% (n=53), and most of them had mild to moderate depressive symptoms. The factors that correlated with life quality were occupational status and cough. The factors that negatively correlated with sleep quality were the presence of digital ulcers, cough, and dysphasia. The presence of cough, dyspnea, and gastroesophageal reflux disease was associated with depressive symptoms.

Conclusions. Our study showed a high prevalence of poor sleep quality and depressive symptoms among SSc patients. We found that gastrointestinal symptoms, respiratory symptoms, and digital ulcers affected patients' life quality, sleep quality, and mental status. Our results also demonstrated that depression was correlated with poor sleep quality, and they were both risk factors for diminished life quality. Identification of these factors would help to make pharmacological and non-pharmacological interventions to improve the quality of life and sleep in SSc patients.

Introduction

Systemic sclerosis (SSc) is a systemic autoimmune disease associated with considerable mortality and morbidity. SSc is more frequent in women, with a peak of onset in the fifth decade of life. Progressive fibrosis involving the skin, vessels, and internal organs is its main feature. The two main disease subtypes are limited cutaneous and diffuse cutaneous SSc. Several organ systems could be affected, including the lungs, heart, kidneys, skin, gastrointestinal tract, vessels, and musculoskeletal system. The two main respiratory system involvements are interstitial lung disease and pulmonary hypertension, which manifest with dyspnea and cough. Progressive skin thickness leads to facial changes, including narrowing of the lips, microstomia, sharpening of the nose, and appearance of deep wrinkles around the lips. Raynaud's phenomenon and vasculopathy lead to digital ulcers. Despite improvements in survival in recent years, the is no curative therapeutic option that can reverse fibrosis and progression of the disease (1, 2).

According to both the severity and chronicity of SSc, health-related quality of life might be affected by this disease. Dyspnea and cough at night, in addition to musculoskeletal pain, gastrointestinal reflux, and digital ulcers, can disturb sleep quality. These all could lead to depression and dissatisfaction with life (3, 4). Data from the literature consistently suggest that depression and poor sleep quality are prevalent among SSc patients and are higher than in healthy controls. This might lead to lower adherence to treatment, which causes deterioration of the disease. While many intrinsic and extrinsic factors influence sleep and life quality, the detection of disease-related factors is important for better management. Routine screening for depressive symptoms and sleep disturbance is recommended according to some of the previous studies (5, 6).

This study aimed to determine the prevalence of self-reported depressive symptoms, poor sleep quality, and poor life quality among patients with SSc, and identify demographical and clinical factors associated with them.

Materials and Methods

This cross-sectional study was conducted in 2022. Between January and October 2022, 120 SSc patients were selected from the rheumatologic patients attending the rheumatology outpatient clinic of Kermanshah University of Medical Sciences, Kermanshah, Iran. We included patients satisfying the 2013 American College of Rheumatology diagnostic criteria for SSc (7). These patients completed our questionnaire, which consists of the Persian form of SF-36, PSQI, the short form of the Beck depression questionnaire, and 26 additional questions about demographic and clinical characteristics. The validity and reliability of the Persian translation of the questionnaire were proved by the previous studies (8-10). The local Clinical Research Ethics Committee approved the study protocol (approval number: IR.KUMS.MED.REC.1401.161). The patients with depressive symptoms or poor sleep quality were referred for additional psychological assessment.

The following data of demographic and clinical characteristics was collected: age, sex, marital status, education level, economic condition, occupational status, place of residence, underlying disease, disease duration, type of SSc (limited or diffuse), frequency of Raynaud's attacks, presence of digital ulcer at the time of completing the questionnaire, number of digital ulcers during recent year, presence of cough, dyspnea by New York Heart Association class, confirmed interstitial lung disease by computed tomography scan, gastroesophageal reflux symptoms, intestinal problems, dysphagia, mouth dryness, presence of telangiectasia, presence of dyspepsia, presence of itching and dryness of skin, presence of facial changes and deformities. The clinical data was self-reported.

Measuring life quality in patients with systemic sclerosis

The Short Form Health Survey 36 (SF-36) questionnaire was used to evaluate life quality in SSc patients. The total score ranges from 0 to 100. Higher scores show better life quality. The questionnaire consists

of eight domains: general health perception (five items), physical functioning (ten items), physical role limitation (four items), emotional role limitation (three items), bodily pain (two items), social functioning (two items), vitality (four items), mental health (five items).

Measuring sleep quality in patients with systemic sclerosis

The Pittsburgh Sleep Quality Index (PSQI) was used to evaluate sleep quality in both SSc patients. The total score ranges from 0 to 21. Higher scores show poorer sleep quality. A total score of more than 5 indicates poor sleep. The questionnaire consists of eighteen questions and seven domains: subjective sleep quality, sleep latency, sleep duration, sleep efficiency, sleep disturbances, use of sleep medication, day daytime dysfunction.

Measuring depressive symptoms in patients with systemic sclerosis

The Beck Depression Short Inventory (BDI-S) was used to evaluate depressive symptoms. It consists of thirteen questions with a total score ranging from 0 to 39. Scores less than 4, mean that the person denies depression, 5-9 indicates that the person is not depressed or has mild depressive symptoms, 10-18 indicates mild-moderate depressive symptoms, 19-29 indicates moderate to severe depressive symptoms, and 30-39 indicates severe depressive symptoms.

Statistical analysis

The collected data was inserted into SPSS software version 25 (IBM, Armonk, NY, USA). Quantitative variables (age, disease duration, and total score of questionnaires) were reported by mean and standard deviation (SD), and we used the independent *t*-test to compare quantitative variables. Qualitative variables were reported as numbers and percentages and compared by the Chi-square test. Multivariate regression analysis was also performed. A p-value less than 0.05 was considered to be statistically significant.

Results

A total of 120 patients completed the questionnaires. Of these, 108 patients (90%) were female. The mean age was 42.23 (SD=8.96). The mean disease duration was 13.58 years (SD=9.62). Most of the patients were married (68.3%), unemployed or housekeepers (60%), and had moderate economic conditions (65%). 75.8 % of the patients lived in urban areas with a population of more than 100,000. Nearly half of the patients had a tertiary education. The most common underlying disease was hypertension (13.3%), followed by hyperlipidemia (10.8%). The majority (93.3%) of the patients experienced Raynaud's attacks, among whom 43.3% reported daily attacks. Digital ulcers were present in nearly half of the patients (47.5%) at the time of completing the questionnaire. The mean of the digital ulcers in the recent year was 5.35. 92.5% of the patients had SSc facial changes and deformities. Table 1 reports the details of the demographic and clinical characteristics of SSc patients.

The total scores of the SF-36 and PSQI questionnaires were 93.25±3.7 and 9.02±4.51, respectively. 103 (85.83%) patients had a PSQI score ≥5, which is consistent with poor sleep quality. Table 2 shows the results of the domains of both questionnaires. The total score of the BDI-S was 9.87±6.87. As shown in Table 2, 35% of the patients had mild to moderate depression, and 25.83% did not have depression.

Figure 1 shows the severity of depressive symptoms among patients. Most of the patients had mild to moderate depression.

Table 3 shows the relationship between different variables and life quality, depressive symptoms, and sleep quality. The obtained results showed higher life quality in employed and retired patients compared to unemployed ones (p=0.019), and decreased life quality in the presence of cough (93.46±7.42 *vs.* 97.07±6.56, p=0.006). The clinical variables which negatively correlated with sleep quality were as follows: digital ulcers (10.17±4.72 *vs.* 7.98±4.08, p=0.007), cough (10.07±4.23 *vs.* 8.16±4.58, p=0.021),

and dysphasia (10.40±4.55 *vs.* 8.07±4.26, p=0.005). Depressive symptoms were associated with cough (11.24±7.01 *vs.* 8.63±6.42, p=0.036), dyspnea (10.56±6.94 *vs.* 7.32±5.68, p=0.026), gastroesophageal reflux disease (GERD) (10.17±6.84 *vs.* 5.33±4.33, p=0.039). Patients with poor sleep quality (PSQI≥5) and those with depression (Beck≥9) had lower scores of SF-36 (p=0.47 and p=0.001). Also, patients with PSQI score ≥5 had higher scores on the Beck questionnaire (10.50±6.94 *vs.* 5.58±3.67, p=0.005).
Table 4 shows multivariable regression analysis to identify independent factors associated with depressive symptoms, poor life, and sleep quality. The presence of a cough remained correlated with poor life quality. PSQI>5 (poor sleep quality) was independently associated with higher scores of BDI-S. The presence of digital ulcers, dysphagia, and depressive symptoms was independently correlated with higher scores of PSQI.

Discussion

With the advances in medicine and available treatments, the number of patients living with a chronic disease has obviously grown in recent years. Most chronic diseases have a large influence on the mental health of the patients and health-related quality of life (11). The World Health Organization provides a specific definition of health, which includes mental health. Health is defined as perfect physical, mental, and social welfare, not just the lack of disease. SSc as a chronic and severe multi-systemic disease might affect the life quality, sleep quality, and mental health of the patients. As far as we know, this is the first study designed to determine the prevalence of depression, sleep disturbance, and poor life quality among SSc patients of Kermanshah province, Iran.
We found a high prevalence of depressive symptoms (44.16%, n=53) based on BDI-S, which was consistent with the previous studies on the SSc patients. Most of these had mild to moderate depressive symptoms (35%, n=42). The prevalence of depressive symptoms among SSc patients was comparable with other chronic diseases such as diabetes mellitus and multiple sclerosis (12, 13), but slightly higher than the general population of Iran (14). Faezi *et al*. studied 114 SSc patients in Iran using the Beck depression inventory and reported that the prevalence of depressive symptoms was 68.4% and was associated with pulmonary and gastrointestinal symptoms (15). In our study, the presence of cough, dyspnea, and gastrointestinal reflux was correlated with depressive symptoms. Interestingly, we found that 30% (n=36) of the patients denied depression and pretended not to have depressive symptoms. As we know, denial is a defensive mechanism against emotional stressors.
Next, we evaluated the patient's sleep quality by PSQI, and the total score was 9.02±4.51. A total score above 5 is considered poor sleep quality. We found 103 (85.83%) patients with poor sleep quality. Among the PSQI domains, the highest score belonged to Sleep latency (2.74±1.52), followed by sleep disturbance (1.58±0.57). Although the sleep duration was acceptable, individuals with SSc experienced a high level of daytime dysfunction. Digital ulcers and cough were the predictors of poor sleep quality. In addition, the presence of depression was associated with higher scores of PSQI. Similarly, previous studies have shown a high prevalence of poor sleep quality among SSc patients (16-20). They revealed that clinical variables, including GERD, overall pain, digital ulcers, dyspepsia, dyspnea, fatigue, pruritus, and depressive symptoms, were associated with poor quality of sleep. In line with our study, Prado *et al*. conducted a survey on 27 SSc patients (21). They used polysomnography and showed significant disturbance in the patient's sleep.
To evaluate the patient's quality of life, we used the SF-36 questionnaire. The total score was 93.25±3.73, which demonstrated good life quality, contrary to most of the previous studies. Hudson *et al*. reported that the life quality of patients diagnosed with SSc is significantly impaired compared to that of the general population and is comparable to or worse than that of patients with other common chronic conditions (22). In our study, significantly lower scores of SF-36 were detected in unemployed patients and those who complained of cough. Leeuwen *et al*. reported that gastrointestinal symptoms, pulmonary arterial hypertension, Raynaud's, and digital ulcers were independently associated with a decrease in

health-related quality of life (23). In comparison to our study, Leeuwen *et al*. showed poorer life quality among their patients. Other previous studies identified additional risk factors for decreased life quality, including functional disability, fatigue, depression, and anxiety (24-26).
There are some limitations and strengths to this study. As SSc is a rare disease, a survey with 120 participants is considered a large sample study and could be representative of the SSc population in Iran. However, multicenter studies are required for additional investigations and more accurate results. Another limitation is the cross-sectional design of the study. Prospective studies should be done to confirm the association between disease symptoms and quality of life or sleep.

Conclusions

This study revealed the high prevalence of depressive symptoms and poor sleep quality in SSc patients in Kermanshah province, which shows the need for regular mental health assessments in these patients. Unemployment and the presence of cough (as an indicator of respiratory involvement) are risk factors for decreased quality of life. The presence of cough, dyspnea, digital ulcers, and GERD is a predictor of poor sleep quality and depressive symptoms. Interventions to manage these clinical variables might contribute to improving the mental health status of SSc patients.

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Table 1. Demographical and clinical characteristics of systemic sclerosis patients.

Variables	Number (percent) Or Mean ± SD	Variables	Number (%) or mean ± SD
Age (mean, SD)	42.23 ± 8.96	Presence of cough	53 (44.2)
Gender		Presence of digital ulcer at the time of completing the questionnaire	57 (47.5)
Female	108 (90)		
Marital status			
Single	32 (26.7)	Number of digital ulcers during recent year (mean, SD)	5.35±3.55
Married	82 (68.3)		
Widow or divorced	6 (5)		
Education level			
Uneducated	4 (3.3)	Confirmed ILD by CT-scan	66 (55)
Less than or equal to high school	47 (39.2)		
College graduate	69 (57.5)		
Economical condition		Gastroesophageal reflux symptoms	
Excellent	2 (1.7)		
Good	21 (17.5)	Never	9 (7.5)
Moderate	78 (65)	Sometimes	58 (48.3)
Bad	19 (15.8)	Always	53 (44.2)
Occupational status		Frequency of Raynaud's attacks	
Student	1 (0.8)	Never	8 (6.7)
Employed	34 (28.3)	Daily	52 (43.3)
Unemployed	72 (60)	Weekly	24 (20)
Retired	13 (10.8)	Monthly	36 (30)
Place of residence			
Urban >100000	91 (75.8)	Presence of telangiectasia	74 (61.7)
Urban <100000	23 (19.2)	Itching and dryness of skin	71 (59.2)
Rural	6 (5)	Presence of facial changes	111 (92.5)
Underlying disease		Dyspnea NYHA class	
Diabetes	6 (5)		
Hypertension	16 (13.3)	I	43 (35.8)
Hyperlipidemia	13 (10.8)	Ii	39 (32.5)
Chronic heart disease	6 (5)	II	8 (6.7)
Chronic kidney disease	2 (1.7)	IV	2 (1.7)
Asthma	3 (2.5)		
Disease duration (years)	13.58 ± 9.62		
Type of SSc		Intestinal problems	76 (63.3)
Limited	46 (38)	Dysphagia	53 (44.2)
Diffuse	43 (35.8)	Dyspepsia	68 (56.7)
Not classified	31 (25.6)	Dry mouth	58 (48.3)

SD, standard deviation; SSc, systemic sclerosis; ILD, interstitial lung disease; CT, computed tomography.

Table 2. Result of the Short Form Health Survey 36 SF-36, Pittsburgh Sleep Quality Index, and Beck questionnaire in patients with systemic sclerosis.

Variables	Number (%) or mean ± SD
SF-36 total score	93.25±3.73
General health perception	10.70±1.96
Physical functioning	21.94±4.62
Physical role limitation	7.16±1.65
Emotional role limitation	4.41±1.23
Bodily pain	5.83±2.93
Social functioning	3.80±0.93
Vitality	12.70±2.44
Mental health	18.64±2.91
PSQI total score	9.02±4.51
Subjective sleep quality	1.22±0.84
Sleep latency	2.74±1.52
Sleep duration	0.91±0.81
Sleep efficiency	0.96±2.25
Sleep disturbances	1.58±0.57
Use of sleep medication	0.53±1.05
Day time dysfunction	1.28±0.92
Number of patients with poor sleep quality (PSQI ≥ 5)	103 (85.83)
Beck total score (mean, SD)	9.87±6.87
Patients denying depression (0-4 score)	36 (30)
Patients without depression (5-9 score)	31 (25.83)
Patients with mild to moderate depression (10-18)	42 (35)
Patients with moderate to severe depression (19-29)	10 (8.33)
Patients with Severe depression (30-39)	1 (0.8)

SF-36, Short Form Health Survey 36; PSQI, Pittsburgh Sleep Quality Index; SD, standard deviation.

Table 3. Demographical and clinical variables in association with depression (Beck questionnaire score), life quality (Short Form Health Survey 36), and sleep quality (Pittsburgh Sleep Quality Index score).

Variables	Beck score	p	PSQI score	p	SF-36 score	p
Age						
<30	13.33± 6.83		10.6±3.41		89.83±7.57	
31-40	10.74±6.71	0.215	6.82±3.69	0.263	92.64±6.90	0.507
41-50	8.30±7.22		6.39±4.24		93.97±7.73	
51-60	13.4±9.81		7.79±5.24		93.52±7.71	
>60	13.4±6.87		8.66±5.69		93.16±7.24	
Gender						
Female	9.96±6.79	0.772	7.13±4.37	0.75	93.21±7.20	0.731
Male	9.75±7.85		6.81±4.45		92.73±7.92	
Marital status						
Single	11.34±7.38	0.362	6.80±4.36	0.869	92.83±7.19	0.134
Married	9.24±6.46		7.16±4.38		92.86±7.23	
Widow or Divorced	12±9.14		7.69±4.68		99±0.09	
Education level						
Uneducated	5.7±4.5	0.315	9.02±8	0.489	96±3.71	0.119
Less than or equal to high school	10.53±7.69		6.35±4.32		92.37±6.27	
College graduate	9.47±6.54		6.96±3.91		93.98±5.24	
Economical condition						
Excellent	11.57±7.33		7.01±4.12		91.94±7	
Good	10.14±6.78	0.248	7.26±4.43	0.762	92.9±6.85	0.360
Moderate	8.23±6.73		6.88±4.51		95.14±4.62	
Bad	4.94±4.5		3.71±2.71		94±1.31	
Occupational status						
Student	9.47±6.54		6.96±3.91		93.98±5.68	
Employed	8.35±5.29	0.305	6.25±2.54	0.489	97.17±7.75	**0.019**
Unemployed	11.76±7.01		8.69±5.08		90.52±6.89	
Retired	5.7±4.5		8±9.02		96±3.71	
Place of residence						
Urban >100000	12.27±7.58	0.111	8.64±4.61	0.243	93.04±6.91	0.365
Urban <100000	9.14±6.43		6.66±4.03		93.43±7.29	
Rural	13.66±7.68		7.7±7.23		88.8±7.82	
Raynaud's attacks						
Yes	9.77±6.76	0.85	9.08±4.60	0.617	95.46±7.22	0.935
No	10.25±7.64		8.25±3.05		95.25±6.64	
Presence of digital ulcer at the time of fulfilling questionnaire		0.228		**0.007**		0.80
Yes	10.59±7.15		10.17±4.72		95.28±6.73	
No	9.09±6.42		7.98±4.08		95.60±7.58	
Presence of cough						
Yes	11.24±7.01	**0.036**	10.07±4.23	**0.021**	93.46±7.42	**0.006**
No	8.63±6.42		8.16±4.58		97.07±6.56	
Dyspnea						
Yes	10.56±6.94	**0.026**	9.20±4.28	0.427	94.82±6.91	0.084
No	7.32±5.68		8.42±5.23		97.50±7.71	
Gastroesophageal reflux						
Yes	10.17±6.84	**0.039**	9.11±4.37	0.435	95.13±7.23	0.091
No	5.33±4.33		7.88±6.21		99.33±5.09	
Dysphagia						
Yes	11.10±6.86	0.083	10.40±4.55	**0.005**	94.14±7.31	0.097
No	8.91±6.64		8.07±4.26		96.35±6.97	
Presence of telangiectasia						
Yes	10.17±6.61	0.46	9.12±4.55	0.768	94.49±7.23	0.068
No	9.23±7.09		8.87±4.49		96.93±6.87	
Presence of facial changes						
Yes	9.70±6.82	0.552	9.02±4.57	0.986	95.39±7.27	0.775
No	11.11±6.62		9.00±3.93		96.11±5.90	
PSQI						
≥5	10.50±6.94	**0.005**			94.92±7.29	**0.47**
<5	5.58±3.67				98.64±5.49	
Beck						
≥9			10.32±4.28	**0.002**	93.32±7.32	**0.001**
<9			7.77±4.43		97.50±6.42	

SF-36, Short Form Health Survey 36; PSQI, Pittsburgh Sleep Quality Index

Table 4. Multivariable regression analysis for the factors associated with depressive symptoms, poor sleep quality, and poor life quality.

Variables	Standard error	β	Confidence interval 95%	p
Factors correlated with SF-36				
Cough	1.70	0.272	0.504 to 7.271	**0.025**
Occupation	0.609	0.035	-1.019 to 1.404	0.753
Factor correlated with BDI-S				
Cough	1.562	-0.044	-3.722 to 2.490	0.694
Dyspnea	1.689	0.123	-1.435 to 5.283	0.258
GERD	2.914	-0.094	-8.269 to 3.322	0.398
PSQI	0.160	0.263	0.073 to 0.708	**0.017**
Factor correlated with PSQI				
Digital ulcer	0.853	-0.235	-3.808 to -0.422	**0.015**
Cough	0.969	-0.078	-2.626 to 1.222	0.471
Dysphagia	0.864	-0.205	-3.585 to -0.156	**0.033**
BDI-S	0.069	0.260	0.036 to 0.309	**0.017**

SF-36, Short Form Health Survey 36; PSQI, Pittsburgh Sleep Quality Index; GERD, gastroesophageal reflux disease; BDI-S, Beck Depression Short Inventory.

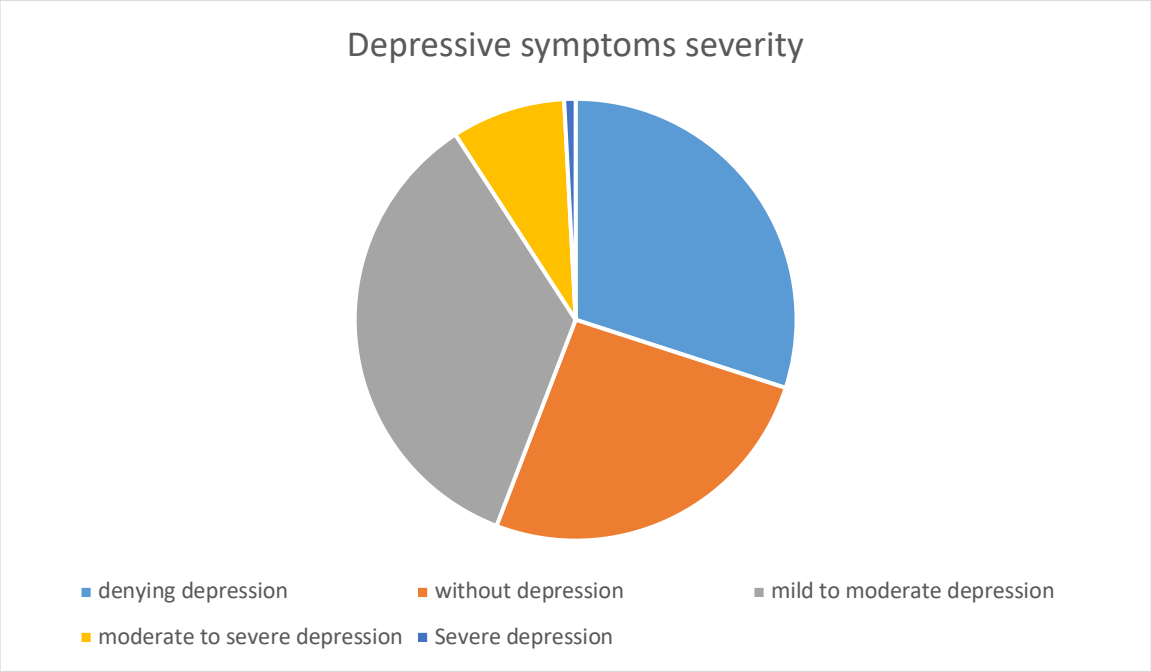

Figure 1. The Beck Depression Short Inventory results and severity of depressive symptoms.