

Correlation between Anxiety and Musculoskeletal Health in Female Adolescents with Generalized Anxiety Disorder in Kafr El Sheikh Governorate, Egypt

Amira Maher¹, Amir Soliman^{2*}

1. S6 student, Faculty of Medicine, Delta University of Science and Technology, Egypt.
 2. Department of Public Health and Community Medicine,
 3. Faculty of Medicine, Delta University of Science and Technology, Egypt.
- *The corresponding author: Amir Soliman, **Mobile:** 00201221300114, **ORCID:** 0000000258992351, **E-mail:** amirsoliman0004@gmail.com

ABSTRACT

Background: Generalized anxiety disorder (GAD) is characterized by excessive, uncontrollable and irrational worry; musculoskeletal health refers to the performance of the locomotor system. Anxiety disorders and musculoskeletal disorders have a significant health impact on daily life.

Objective: The aim of the current study is to assess the correlation between anxiety and musculoskeletal health in female adolescents with GAD in Kafr El Sheikh.

Patients and methods: A total of 50 participant female adolescents with GAD were recruited from outpatient Psychiatry Clinic in Kafr El Sheikh University hospital, from June 2022 until November 2022. Two questionnaires were filled by every participant to assess the correlation between Hamilton Anxiety Rating Scale (HAM-A) to evaluate anxiety and Musculoskeletal Health Questionnaire (MSC-HQ) to evaluate musculoskeletal health.

Results: There was a statistically significant negative correlation between most of aspects of HAM-A Scale and most of aspects of MSC-HQ. Higher scores of HAM-A (indicating higher anxiety severity) were associated with lower score of MSC-HQ aspects (indicating higher musculoskeletal disorders severity). The strongest negative correlation was between depressed mood domain of HAM-A Scale and emotional wellbeing domain of MSC-HQ ($r = -0.526$, $p = 0.001$), while the weakest negative correlation was between anxious mood domain of HAM-A Scale and fatigue or low energy domain in MSC-HQ ($r = -0.282$, $p = 0.050$).

Conclusion: In female adolescents with GAD higher anxiety severity is associated with higher musculoskeletal disorders severity and vice versa with strongest correlation between depressed mood and emotional wellbeing.

Keywords: anxiety, females, adolescents, musculoskeletal, Kafr El Sheikh, correlational study, Delta University of Science and Technology.

INTRODUCTION

Anxiety is undesirable condition of inner confusion and feelings of fear from expected events⁽¹⁾. Anxiety disorders are a cluster of mental disorders manifested by exaggerated feeling of worry and dread about future events as a reaction to current events⁽²⁾. There are a number of anxiety disorders: such as specific phobias, selective mutism, social anxiety, separation anxiety, panic disorder, and generalized anxiety disorder (GAD)⁽²⁾.

GAD is characterized by undue, overwhelming and usually unreasonable worry about events or activities; this may be manifested by physical symptoms, like tachycardia and tremors⁽²⁾.

The musculoskeletal system is a vital constituent of human health; not only providing structure and movement to the body, but also interacting with other organs in the body via biochemical pathways to the extent that we can consider it as an endocrine system⁽³⁾.

Musculoskeletal health refers to the performance of the locomotor system, comprising healthy muscles, bones, joints and adjacent connective tissues, musculoskeletal impairments comprise more than 150 diseases/morbid conditions that affect the system⁽³⁾,

Musculoskeletal disorders are important reasons of disability and its costs, with loss of productivity in various economic fields⁽⁴⁾, negative health impacts of musculoskeletal disorders may extend to total loss of function⁽⁵⁾.

Anxiety disorders and musculoskeletal disorders have a significant health impact on people everyday life all over the world, so researching their correlation helps in updating guidelines for diagnosis and treatment of both conditions.

The aim of the current study is to assess the correlation between anxiety and musculoskeletal health in female adolescents with GAD in Kafr El Sheikh Governorate.

PATIENTS AND METHODS

A correlational study was conducted in Kafr El Sheikh Governorate, Egypt, at a period of 5 months, from June 2022 till November 2022 and included female adolescent participants with GAD from inhabitants of Kafr El Sheikh Governorate taken from Outpatient Psychiatry Clinic in Kafr El Sheikh University Hospital, Egypt.

Inclusion criteria:

1. Female gender.
2. Adolescents (10-19 years).
3. From community-dwellers.
4. Diagnosed to have GAD.

Exclusion criteria:

1. Sensory and/or motor disability.
2. Severe cognitive impairment.
3. Chronic diseases or deformities in muscles, bones, and/or joints.

Sample Size:

A representative sample of female adolescent participants with GAD was recruited from inhabitants of Kafr El Sheikh Governorate, Egypt. Sample size was calculated using Open Epi I program at confidence interval 95% and power of 80% to be at least 50 participants from both urban and rural areas.

Study procedures and tools:

Two questionnaires were filled by the participants in presence of one or more members of the research team, to evaluate correlation between Hamilton Anxiety Rating (HAM-A) Scale to evaluate anxiety and Musculoskeletal Health Questionnaire (MSC-HQ) to evaluate musculoskeletal health.

1. Hamilton Anxiety Rating (HAM-A) Scale:

This psychological questionnaire helps in rating severity of anxiety, and it was published for the first time by Max Hamilton in 1959 to be one of the oldest scales used for rating of anxiety.

Although it is one of the oldest scales it remains one of the most famous and widely used anxiety rating questionnaires. It refers anxiety to, for example, a mental state, and a drive, a reaction to a specific situation, a personality attribute and a psychiatric disorder^(6,7). HAM-A Scale is used to rate anxiety in patients with established diagnosis of anxiety neurosis⁽⁸⁾.

2. Musculoskeletal Health Questionnaire (MSC-HQ):

This questionnaire was developed by the universities of Oxford and Keele in the year 2012, and the goal of this

questionnaire is to evaluate different domains concerned with health and wellbeing of musculoskeletal system.

It includes 14 items; including symptoms, physical functioning, daily activities, physical well-being and functioning, confidence to cope with symptoms, understanding condition and social activities.

The participant answers every item of the questionnaire by marking on a 5-point scale (codes of responses are ranging from 'not at all'=4 to 'extremely'=0, while responses of the items 12 'understanding condition' and 13 'confidence in managing symptoms, are in the reverse order), the sum of scores is ranging from zero to 56, whereas 56 is the best musculoskeletal health state⁽⁹⁾.

Ethical considerations:

Approval of the study was obtained from the Institutional Review Board (IRB), Faculty of Medicine, Delta University for Science and Technology. Every patient signed an informed written consent for acceptance of participation in the study. This work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

Statistical Analysis

The collected data were coded, processed and analyzed using the SPSS (Statistical Package for Social Sciences) version 22 for Windows® (IBM SPSS Inc, Chicago, IL, USA). Data were tested for normal distribution using the Shapiro Walk test.

Qualitative data were represented as frequencies and relative percentages. Quantitative data were expressed as mean and standard deviation (SD). The Spearman's rank-order correlation is used to evaluate the strength and direction of a linear relationship between two non-normally distributed continuous variables and/or ordinal variables. P-value ≤ 0.05 was considered significant.

RESULTS

The study included 50 female adolescent participants with GAD. The age of participants ranged from 12 to 19 years, and their mean age was 16 (SD 2.26) years. Table 1 summarizes HAM-A Scale of the participants.

Table (1) Distribution of Hamilton anxiety scale items among participants.

Item	N= 50	%
<u>Anxious mood</u>		
Mild	1	2
Moderate	5	10
Sever	8	16
Very sever	36	72
<u>Tension</u>		
Moderate	22	44
Sever	21	42
Very sever	7	14
<u>Fears</u>		
Moderate	10	20
Sever	40	80
<u>Insomnia</u>		
Not present	1	2
Mild	5	10
Moderate	42	84
Sever	2	4
<u>Intellectual</u>		
Moderate	9	18
Sever	40	80
Very sever	1	2
<u>Depressed mood</u>		
Mild	17	34
Moderate	22	44
Sever	11	22
<u>Somatic(muscular)</u>		
Moderate	18	36
Sever	31	62
Very sever	1	2
<u>Somatic sensory</u>		
Moderate	19	38
Sever	31	62
<u>Cardiovascular symptoms</u>		
Not present	1	2
Mild	27	54
Moderate	22	44
<u>Respiratory symptoms</u>		
Not present	29	58
Mild	21	42
<u>Gastrointestinal symptoms</u>		
Not present	1	2
Mild	13	26
Moderate	36	72
<u>Genitourinary symptoms</u>		
Mild	13	26
Moderate	37	74
<u>Autonomic symptoms</u>		
Not present	31	62
Mild	18	36
Moderate	1	2
<u>Behavior at interview</u>		
Mild	2	4
Moderate	48	96

Table 2 shows distribution of MSC-HQ items among participants.

Table (2) Distribution of Musculoskeletal Health Questionnaire items among participants.

	Item	N= 50	%
<u>Pain/stiffness during the day</u>	All the time	1	2
	Frequently	43	86
	Sometimes	6	12
<u>Pain/stiffness during the night</u>	Frequently	29	58
	Sometimes	21	42
<u>Walking</u> -	All the time	2	4
	Frequently	21	42
	Sometimes	27	54
<u>Washing/dressing</u>	Frequently	4	8
	Sometimes	19	38
	Rarely	27	54
<u>Physical activity level</u>	All the time	2	4
	Frequently	21	42
	Sometimes	27	54
<u>Work/daily routine</u>	All the time	2	4
	Frequently	23	46
	Sometimes	25	50
<u>Social activities</u>	Frequently	26	52
	Sometimes	24	48
<u>Needing help</u>	All the time	2	4
	Frequently	23	46
	Sometimes	25	50
<u>Sleep</u>	Frequently	27	54
	Sometimes	20	40
	Rarely	2	4
	Not at all	1	2
<u>Fatigue</u>	Frequently	2	4
	Sometimes	20	40
	Rarely	27	54
	Not at all	1	2
<u>Emotional well-being</u>	Frequently	3	6
	Sometimes	26	52
	Rarely	21	42
<u>Understanding condition and current treatment</u>	Frequently	26	52
	Moderately	24	48
<u>Confidence in being able to manage symptoms</u>	Frequently	28	56
	Sometimes	22	44
<u>Overall impact</u>	Frequently	29	58
	Sometimes	21	42

Table 3 summarizes the correlations between aspects of HAM-A Scale and MSC-HQ. The table shows that there is a significant negative correlation between anxious mood domain (denoting Worries, anticipation of the worst, fearful anticipation, irritability) of HAM-A Scale and washing/dressing domain (denoting interference with ability of washing and dressing), sleep domain (denoting having sleep troubles), fatigue or low energy domain (denoting feeling of fatigue or low energy) and emotional wellbeing domain (denoting feeling anxious or low in mood because of joint or muscle symptoms) of MSC-HQ.

The table shows also a significant negative correlation between tension domain (denoting feelings of tension, fatigability, startle response, moved to tears easily, trembling, feelings of restlessness, inability to relax) of HAM-A Scale and physical activity domain (denoting physical activity problems) and confidence domain (denoting feeling anxious or low in mood because of joint or muscle symptoms) in MSC-HQ.

The table reveals a significant negative correlation between insomnia domain (denoting difficulty in falling asleep, broken sleep, unsatisfying sleep) of HAM-A, sleep domain (denoting having sleep troubles) and fatigue domain (denoting feeling of fatigue or low energy) in MSC-HQ.

The table reveals also a significant negative correlation between intellectual domain (denoting difficulty in concentration, poor memory) of HAM-A, and sleep domain (denoting having sleep troubles) in MSC-HQ.

There is also a significant negative correlation between depressed mood domain (denoting loss of interest, lack of pleasure in hobbies, depression, early waking, and diurnal swing) of HAM-A Scale and washing/dressing domain (denoting interference with ability of washing and dressing), sleep domain (denoting having sleep troubles), fatigue or low energy domain (denoting feeling of fatigue or low energy) and emotional wellbeing domain in MSC-HQ. Moreover, a significant negative correlation between somatic sensory domain (denoting tinnitus, blurring of vision, hot and cold flushes, feelings of weakness, pricking sensation) of HAM-A Scale and Pain/stiffness during day domain (denoting how severe was the usual joint or muscle pain and/or stiffness overall during the day) in MSC-HQ.

There is a significant negative correlation between cardiovascular symptoms domain (denoting Tachycardia, palpitations, pain in chest, throbbing of vessels, fainting feelings, missing beat) of HAM-A Scale and fatigue or low energy domain (denoting feeling of fatigue or low energy) and emotional wellbeing domain in MSC-HQ.

There is a significant negative correlation between respiratory symptoms domain (denoting Pressure or constriction in chest, choking feelings, sighing, dyspnea) of HAM-A Scale and washing/dressing domain (denoting interference with ability of washing and dressing), sleep domain (denoting having sleep troubles), fatigue or low energy domain (denoting feeling of fatigue or low energy) and emotional wellbeing domain in MSC-HQ.

The table shows that there is a significant negative correlation between GIT symptoms domain (difficulty in swallowing, wind abdominal pain, burning sensations, abdominal fullness, nausea, vomiting, borborygmi, looseness of bowels, loss of weight, constipation) of HAM-A Scale and pain/stiffness during day domain, washing/dressing domain (denoting interference with ability of washing and dressing), sleep domain (denoting having sleep troubles), fatigue or low energy domain (denoting feeling of fatigue or low energy) and emotional wellbeing domain in MSC-HQ.

The table shows that there is a significant negative correlation between genitourinary symptoms domain (frequency of micturition, urgency of micturition, amenorrhea, menorrhagia, development of rigidity, premature ejaculation, loss of libido, impotence) of HAM-A Scale and pain/stiffness during day domain, washing/dressing domain (denoting interference with ability of washing and dressing) and sleep domain (denoting having sleep troubles) in MSC-HQ.

The table shows that there is a significant negative correlation between behavior at interview domain (fidgeting, restlessness or pacing, tremor of hands, furrowed brow, strained face, sighing or rapid respiration, facial pallor, swallowing, etc.) of HAM-A Scale and pain/stiffness during day domain in MSC-HQ.

The table shows that there is a statistically significant correlation between most of aspects of HAM-A Scale and most of aspects of MSC-HQ. There is a negative correlation between most of aspects of HAM-A Scale, most of aspects of MSC-HQ, higher score on HAM-A Scale (indicating higher anxiety severity), is associated with lower score on MSC-HQ aspects (indicating higher musculoskeletal disorders severity), this means higher anxiety severity is associated with higher musculoskeletal disorders severity and vice versa.

The strongest significant negative correlation was between depressed mood domain of HAM-A Scale and emotional wellbeing domain of MSC-HQ ($r = -0.526$, $p = 0.001$), while the weakest significant negative correlation was between anxious mood domain of HAM-A Scale and fatigue or low energy domain in MSC-HQ ($r = -0.282$, $p = 0.050$).

Table (3): Correlation between Hamilton Anxiety Rating Scale and Musculoskeletal Health Questionnaire.

Variable		Pain stiffness during day	Washing/ Dressing	Physical activity	Sleep	Fatigue or low energy	Emotional well-being	Confidence
Anxious mood	R	.182	-.386**	.225	-.335*	-.282*	-.288*	.009
	P-value	.212	.006	.121	.019	.050	.045	.950
Tension	R	.127	-.129	-.294*	.013	.096	.077	-.287*
	P-value	.383	.377	.040	.932	.513	.600	.046
Insomnia	R	-.226	.171	-.006	-.420**	-.382**	-.429**	.038
	P-value	.119	.240	.965	.004	.007	.002	.794
Intellectual	R	-.262	.244	-.187	-.404**	-.166	-.171	.066
	P-value	.069	.091	.199	.004	.253	.241	.651
Depressed mood	R	.281	-.432**	.135	-.300*	-.507**	-.526**	-.237
	P-value	.050	.002	.354	.036	.001	.001	.102
Somatic sensory	R	-.290*	.189	-.210	.108	.000	-.015	.012
	P-value	.044	.193	.148	.462	.998	.920	.936
Cardiovascular symptoms	R	.109	-.213	.045	-.105	-.503**	-.515**	-.094
	P-value	.456	.141	.759	.472	.001	.001	.523
Respiratory symptoms	R	.118	-.387**	.102	-.277	-.307*	-.327*	-.249
	P-value	.417	.006	.486	.054	.032	.022	.085
GIT	R	-.290*	-.508**	-.125	-.319*	-.326*	-.353*	.037
	P-value	.043	.001	.391	.026	.022	.013	.801
Genitourinary symptoms	R	-.471**	-.425**	-.076	-.449**	.228	.260	-.015
	P-value	.001	.002	.603	.001	.115	.071	.918
Behavior at interview	R	-.318*	.280	-.191	-.091	.271	.260	-.021
	P-value	.026	.051	.189	.533	.060	.072	.885

DISCUSSION

This study revealed that in the studied population there is a statistically significant correlation between most of aspects of HAM-A Scale and most of aspects of MSC-HQ. There is a negative correlation between most of aspects of HAM-A Scale, most of aspects of MSC-HQ, higher score on HAM-A Scale (indicating higher anxiety severity), is associated with lower score on MSC-HQ aspects (indicating higher musculoskeletal disorders severity). The strongest significant negative correlation was between depressed mood domain of HAM-A Scale and emotional wellbeing domain of MSC-HQ while the weakest significant negative correlation was between anxious mood domain of HAM-A Scale and fatigue or low energy domain in MSC-HQ.

Some previous studies revealed that the risk of musculoskeletal disorders (MSDs) is increased with anxiety and depression through a vague pathophysiological mechanism, there is a hypothesis that anxiety and/or depression may produce stress and this stress increases muscle pain and tension which interferes with normal blood supply and oxygenation, this leads to

increased release of algescic substance in muscle tissues specially in long term painful conditions of muscles^(10,11).

Results of our study is in agreement with some former studies, as the study conducted in 2016 and found that: in female healthcare professionals there is a correlation between pre-existing anxiety and/or depression and musculoskeletal disorders, female participants with 2 years history of the mentioned psychological conditions have five folds increase in the risk of having significant musculoskeletal disorders episodes more than those who are free from these psychological symptoms (OR 5.01; 95% CI 2.20-12.05; p <0.01)⁽¹²⁾.

An Intervention study⁽¹³⁾ also revealed correlations between some psychological disorders and MSDs, for example there is a correlation between anxiety disorders and herniation of intervertebral lumbar or cervical discs, a correlation between anxiety and mood disorders from one side and osteopenia from the other side, a correlation between major depression and chronic back pain, and finally these all have a negative impact on life satisfaction⁽¹⁴⁾.

A research carried out in the city of Caxias do Sul in Southern Brazil (2016) including females from the age group of 60 years and more, revealed a high correlation between anxiety and depression symptoms from one side and chronic musculoskeletal pain from the other side, which lead to a negative effect on quality of life ⁽¹⁵⁾.

The study of Leo and Ashwin in 2022⁽¹⁶⁾ on patients who attend for orthopedic care and have depression and/or anxiety, participants of this study were divided into 3 groups with 51 participant in every group, the first group received standard orthopedic care, the second group received standard orthopedic care in addition to psychological counseling, and the third group received standard orthopedic care in addition to a digital mental health intervention. After two months follow up the three groups showed a significant differences in outcome regarding PROMIS Depression and Anxiety scores and PROMIS Pain Interference and Physical Function scores, patients who received standard orthopedic care in addition to a digital mental health intervention showed better results than patients who received standard orthopedic care only, there was a significant improvement in PROMIS Depression (-4.8 points), Pain Interference (-2.6), and Physical Function (2.7) (all $P \leq 0.04$). The same group of patients who received standard orthopedic care in addition to a digital mental health intervention showed also better results than patients who received psychological counseling plus standard orthopedic care, there was a significant improvement in PROMIS Physical Function ($r = 2.4$, $P = 0.04$) and equivalent improvements in PROMIS Depression, Anxiety, and Pain Interference.

Another research conducted in Indianapolis during the period (December 2005 - June 2007) to compare severity of musculoskeletal pain in four groups based on having anxiety and/or depression:

- 1- "Pain only" group, (results showed that this group had the least severity of pain).
- 2- "Pain plus depression plus anxiety" group (results showed that this group had the greatest pain severity).
- 3-4 "Pain plus depression" and "Pain plus anxiety" groups (had intermediate severity of pain) ⁽¹⁷⁾.

Another study suggested some ways to explain the association between muscle pain and anxiety:

- (a) Muscle tension is an essential component of the diagnostic criteria for GAD.
- (b) Pain is a mainstream manifestation and a respectable sign of anxiety disorders.
- (c) Anxiety is an independent indicator for the quality of life in chronic major depression patients.
- (d) Anxiety may cause higher degrees of pain chronicity.
- (e) There is a relationship between major depression from one side and terror, anxiety, and avoidance ⁽¹⁸⁾.

A study conducted in 2016, reported that symptoms of MSDs during the past 12 months are predictors for insomnia in a sample of Brazilian workers ⁽¹⁹⁾.

In Netherlands (2004-2007) a study revealed that insomnia is a risk factor for chronic musculoskeletal pain, this result was the fruit of 2, 4 and 6 years follow ups assessment ⁽²⁰⁾.

After 3 years and on the other side of the ocean in the United States of America, in the period between June 2010 till December 2011, another research ⁽²¹⁾ reported that in disability population, participants with chronic musculoskeletal pain have prevalence of insomnia as follows: 5.5% non-clinically significant insomnia, 21.2% sub-threshold insomnia, 39.6% moderate clinical insomnia and lastly 33.7% sever clinical insomnia, there was a weak correlation between insomnia and pain after controlling depressive disorder, which denotes that insomnia is just a modest part of depression and pain constructs.

Although insomnia can result from painful medical disorders, sometimes it may originate from a separate condition ⁽²²⁾, dysfunctional sleep and sleep habits may be principal factors that prolong and keep insomnia. Thus, sleep disturbance is not a direct result of pain severity; here insomnia can develop from a secondary manifestation of chronic pain to a primary comorbid condition with same features as primary insomnia ⁽²³⁾.

In conclusion, in female adolescents with GAD there is a statistically significant negative correlation between most of aspects of HAM-A Scale and most of aspects of MSC-HQ, this means higher anxiety severity is associated with higher MSDs severity and vice versa. The strongest significant negative correlation was between depressed mood domain of HAM-A Scale and emotional wellbeing domain of MSC-HQ, while the weakest significant negative correlation was between anxious mood domain of HAM-A Scale and fatigue or low energy domain in MSC-HQ.

DECLARATIONS

- **Consent for publication:** The author gives consent for the publication of the manuscript and all its appendices and details to be published in this scientific journal.
- **Availability of data and materials:** The authors declare that necessary data and materials for conducting the study were available. If someone wants to request, the data from this study he can contact Amir Soliman (amirsoliman0004@gmail.com).
- **Competing interests:** The authors declare no conflict of interest or competing interests
- **Funding:** This research was funded by the authors.

- **Authors' contributions:** Conceptualization, questionnaire designing and data collection, A.M. methodology, data analysis, A.S. writing—original draft preparation, review and editing was done by both authors, then they have read and agreed on the final version of the manuscript.

ACKNOWLEDGEMENTS:

This project was supported by Delta University for Science and Technology; we thank all the participants and their families, sincere thanks to institutions, organizations and associations that care for them and graciously facilitated meetings with them.

REFERENCES

1. **Miceli M, Castelfranchi C (2014):** Expectancy and emotion, OUP Oxford, Website: [Expectancy and emotion - Maria Miceli, Cristiano Castelfranchi](#)
2. **American Psychiatric Association (2013):** Diagnostic and Statistical Manual of Mental Disorders (Fifth ed.), Arlington, VA: American Psychiatric Publishing. pp. 189. Website: [Diagnostic and statistical manual of mental disorders: DSM-5™, 5th ed. - PsycNET \(apa.org\)](#)
3. **WHO (2022): musculoskeletal fact sheet** .Website: <https://www.who.int/news-room/fact-sheets/detail/musculoskeletal-conditions>
4. **Varatharajan S, Cote P, Shearer S, Loisel P, Wong J (2014):** Are work disability prevention interventions effective for the management of neck pain or upper extremity disorders? A systematic review by the Ontario Protocol for Traffic Injury Management (OPTIMA) collaboration. *J. Occup. Rehab.*, 24:692-708.
5. **Yelin E, Weinstein S, King T (2016):** The burden of musculoskeletal diseases in the United States. *Semin Arthritis Rheum.*, 46(3):259-260. doi: 10.1016/j.semarthrit.2016.07.013.
6. **McDowell I, Newell C, McDowell I (2006):** Measuring health: a guide to rating scales and questionnaires (Vol. 268), New York, Oxford University Press.
7. **Maier W, Buller R, Philipp M, Heuser I (1988):** The Hamilton Anxiety Scale: reliability, validity and sensitivity to change in anxiety and depressive disorders. *J. Affect Disord.*, 14(1):61-68.
8. **Hamilton T (1959):** Assessment of anxiety states by rating. *Br J Med Psychol.*, 32:50-55.
9. **Hill J, Kang S, Benedetto E, Myers H et al. (2016):** Development and initial cohort validation of the Arthritis Research UK musculoskeletal health questionnaire (MSK-HQ) for use across musculoskeletal care pathways. *BMJ Open*, 6(8):e012331.
10. **Linton S (2000):** A Review of Psychological Risk Factors in Back and Neck Pain, *Spine*, 25: 1148-1156.
11. **Larsson B, Sogaard K, Rosendal L (2007):** Work related neck-shoulder pain: a review on magnitude, risk factors, biochemical characteristics, clinical picture and preventive interventions. *Best Practice and Research Clinical Rheumatology*, 21:447-463.
12. **Del Campo M, Romo P, de la Hoz R et al. (2017):** Anxiety and depression predict musculoskeletal disorders in health care workers, *Arch Environ Occup Health*, 72(1):39-44.
13. **Kent P, Kjaer P (2012):** The efficacy of targeted interventions for modifiable psychosocial risk factors of persistent nonspecific low back pain- A systematic review, *Manual Therapy*, 17:385-401.
14. **Heikkinen J, Honkanen R, Williams L et al. (2019):** Depressive disorders, anxiety disorders and subjective mental health in common musculoskeletal diseases: A review. *Maturitas*, 127:18-25.
15. **Storchi S, Rodrigues A, Bertoni J, Portuguez M (2016):** Quality of life and anxiety and depression symptoms in elderly females with and without chronic musculoskeletal pain. *Rev Dor São Paulo.*, 17(4):283-288.
16. **Ashwin L (2022):** Digital Mental Health Intervention for Musculoskeletal Patients with Co-existing Depression and/or Anxiety, institute of clinical and translational sciences, Washington university in st Louis, Website: <https://icts.wustl.edu/21-digital-mental-health-intervention-for-musculoskeletal-patients-with-co-existing-depression-and-or-anxiety/>
17. **Bair M, Wu J, Damush T, Sutherland J, Kroenke K (2008):** Association of depression and anxiety alone and in combination with chronic musculoskeletal pain in primary care patients, *Psychosom Med.*, 70(8):890.
18. **Lucchetti G, Oliveira A, Mercante J, Peres M (2012):** Anxiety and fear-avoidance in musculoskeletal pain. *Current Pain Headache Rep.*, 16(5):399-406.
19. **Moreno C, Lowden A, Vasconcelos S, Marqueze EC (2016):** Musculoskeletal pain and insomnia among workers with different occupations and working hours. *Chronobiol Int.*, 33(6):749-753.
20. **Generaal E, Vogelzangs N, Penninx B, Dekker J (2017):** Insomnia, Sleep Duration, Depressive Symptoms, and the Onset of Chronic Multisite Musculoskeletal Pain. *Sleep*, 40(1). doi: 10.1093/sleep/zsw030.
21. **Asih S, Neblett R, Mayer T, Brede E, Gatchel R (2014):** Insomnia in a chronic musculoskeletal pain with disability population is independent of pain and depression, *Spine J.*, 14(9):2000-2007.
22. **Currie S, Wilson K, Curran D (2002):** Clinical significance and predictors of treatment response to cognitive-behavior therapy for insomnia secondary to chronic pain. *J Behav Med.*, 25(2):135-153.
23. **Tang N, Goodchild C, Hester J, Salkovskis P (2012):** Pain-related insomnia versus primary insomnia: a comparison study of sleep pattern, psychological characteristics and cognitive-behavioral processes. *Clin J Pain*, 28(5):428-436.