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Impact of proposed home based exercise program on non-specific lower back pain intensity and on weight regulation in college females in crises environment

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Abstract:

Current study aimed to discern the effect of suggested exercise program on the level of pain intensity and on weight regulation among university female students who suffer from chronic nonspecific lower back pain in the Syrian university environment during the crises. The sample was limited to the colleges of Damascus University and its branches, and the number of the study sample was (89) female who were chosen randomly, and from the age of 17-29 years. The researcher used an adopted exercise program that includes strengthening and stretching exercises, as well as exercises to promote the level of aerobic capacity. In addition, the Numerical Pain Rating Scale (NRS) was applied and the students were classified according to their BMI value. The percentage of normal weight was 42.70% and overweight was 37.08% and obese female students was 20.22% and that the level of pain intensity of the students with normal weight was moderate (2.84), while among the overweight girls was medium (4.63), and among those belonging to the obese category, touched the level of strong pain (5.52). The exercise program had a significant effect (p=0.0001) in reducing both weight and pain intensity. University females tend to be overweight within the course of ongoing crises. The relationship between pain intensity with BMI was statistically significant. Effects of the suggested exercise program were significantly positive in decreasing pain and reducing weight.

Key Words: College Females, Exercise Program, BMI, Pain Intensity.

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تأثير برنامج مقترح من التمارين المنزلية في شدة آلام أسفل الظهر غير النوعية، وفي تنظيم الوزن لدى الإناث الجامعيات خلال الأزمة

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الملخص:

هدفت الدراسة الحالية إلى معرفة تأثير برنامج تمرين مقترح في مستوى شدة الألم وفي تنظيم الوزن لدى الطالبات الجامعيات اللاتي يعانين من آلام أسفل الظهر المزمنة غير النوعية في البيئة الجامعية السورية أثناء الأزم. واقتصرت العينة على كليات جامعة دمشق وفروعها، وبلغ عدد عينة الدراسة (89) أنثى تم اختيارهن عشوائياً، وأعمارهن 17–29 سنة. واستخدم الباحث برنامج تمريني معتمد يتضمن تمارين التقوية والتمطيط، بالإضافة إلى تمارين رفع مستوى القدرة الهوائية. بالإضافة إلى ذلك، تم تطبيق مقياس تقييم الألم الرقمي (NRS) وتم تصنيف الطالبات وفقًا لقيمة مؤشر كتلة الجسم لديهن. بلغت نسبة الوزن الطبيعي 42.70% والوزن الزائد 37.08% ونسبة البدانة 20.22% وكان مستوى شدة الألم لدى الطالبات ذوات الوزن الطبيعي متوسطاً (2.84)، بينما كان لدى الطالبات ذوات الوزن الزائد متوسطاً (4.63) وأما شدة الألم لدى المنتمين إلى فئة البدانة، فقدت لامست مستوى الألم الشديد(5.52) وكان للبرنامج التمريني تأثير معنوي (P=0.0001) في تخفيف الوزن وفي شدة الألم. مع العلم أن الإناث الجامعيات تميل إلى زيادة الوزن خلال الأزمات المستمرة. أما العلاقة بين شدة الألم ومؤشر كتلة الجسم فكانت ذات دلالة إحصائية. وكانت آثار برنامج التمرين المقترح إيجابية بشكل ملحوظ في تقليل الألم وخفض الوزن.

الكلمات المفتاحية: طالبات الكلية، البرنامج التمريني، مؤشر كتلة الجسم، شدة الألم.

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1- Introduction:

Non-specific low back pain (LBP) is commonly defined as pain in the lumbo-sacral region. It often occurs without any clinical observations or identifiable anatomical or pathophysiological origin. Moreover, it causes painful limitation of movement (Maher et al. 2017, 736-747). This type of chronic pain is a prevalent musculoskeletal condition, affecting a large proportion of world population, and it is liable for 85-90% of LBP among individuals from both sexes and from different health conditions and age groups (Vos et al. 2012, 2163-2196). The Global Study of the Prevalence of Diseases (GBD, 2010), stated that the percentage of individuals of different ages who suffer from LBP has reached 9.4%, and it is widespread in the modern era and comes after headaches in terms of frequency and prevalence (Hoy et al. 2014, 968-974, Maher et al. 2017). Furthermore, the World Health Organization (WHO) indicates that 70% of the world's population will experience non-specific LBP at some point in their lifetime. In addition, if left untreated, temporary LBP may develop to chronic (WHO, 2020). Even though, longitudinal studies (Nascimento & Costa 2015, 6) disclosed that the prevalence of chronic LBP in any society extends to 18%, and this percentage increases to 31% if the question was about feeling LBP in the last 30 days. Moreover, it increases further to 38% if the question was about the last 12 months, and it extends to 39% if the question was about any time during lifespan. Additionally, LBP ranks third in upper treatment costs after heart, arteries diseases and cancer, and it still constitutes a real health challenge in terms of prevention and treatment, even with the diversity of treatment and prevention methods, and the notable development in the techniques used in various health and medical fields. In view of frequent causes, body weight and prolonged, unhealthy positioning are identified as substantial risk factors for LBP (Heuch et al. 2015, 10, Smuck et al. 2014, 209-216), especially among university students. However, other than the rising propensity of overweight and obesity among university students (Othman 2018, 51-80), they are vulnerable to stationary, and in many settings, unhealthy positioning for long periods due to compulsory deskbound in universities. In conjunction with many other diseases and syndromes, researchers (Nelson-Wong and Callaghan 2010, 1125-1133) consider this as a major cause of LBP and of the emergence of both temporary and chronic posture deformities such as scoliosis, kyphosis, and lordosis. Moreover, overweight, obesity and physical inactivity are ascertained as a major determinant of the severity of LBP (Heuch et al. 2015, 10, Smuck et al. 2014, 209-216). Regarding curative and adjustment procedures, exercise and physical activity (PA) programs are comprehensively intended for treating and preventing non-specific LBP, as they have substantial properties in reducing pain severity and recurrence. They are among the most recommended therapeutic protocols in clinics, and hospitalization centers. This has been authenticated by various studies, including the analytical study by Sheri and Falah (2017, 1410-1418), which included an analysis of research papers related to exercise and PA programs and their procedures in treating and preventing LBP, and Quentin et al. (2021) which examined the home based therapeutic exercise programs only. The analyzed researches suggested several therapeutic exercise protocols that are contingent on specific movement's series at homes, and in public PA settings and/or in physical therapy and hospitalization centers. While therapeutic exercise programs are mentioned as

first-line treatment (Kanas et al. 2018, 824-831, Balagué et al. 2012, 483-491), even though, there is lack of data about the effectiveness of home-based exercise, as well as data regarding the optimal intensity, frequency and duration of exercise. However, proficiently supervised exercise programs are conventionally expected to produce the worthiest outcomes. On the other hand, due to the present conflict in Syria and due to the multifaceted, inherited social obstacles, home-based exercise programs were advantageous, particularly for females in the present study. However, female students in Damascus University are generally classified as physically inactive (Othman & Dandi 2021, 318-348). This, with taking into consideration that people disposed to be physically inactive, overweight and/or obese during crises (Stockwell et al. 2021, 7-36). Based on the above details, the current study focuses on the impact of a suggested home based exercise program on pain intensity (PI) levels and on body weight among female university students, in spite of the fact that there are no local researches related to exercise programs procedures regarding LBP in college females in Syrian universities. The study aims to explore the effects of exercise program on body weight, particularly whether it helps control or reduce it, and how weight correlate with PI. Additionally, the study seeks to conclude if the exercise program has measurable effects in reducing PI for female university students with chronic, non-specific LBP. The main indication of the recent study was the experimenced obstacles faced individuals in their seeking health and medical care.

The study's objectives are met through the inspection of three questions: (1) What are the initial values of key variables for female university students in terms of weight classification and for the overall sample? (2) Are there differences in the studied variables before and after the exercise program is completed? Moreover, is the number and percentage of female students changed based on weight classification after completing the exercise program? (3) Is there a relationship between PI and body mass index for the total sample before and after the exercise program?

2- Literature review:

In overall crises, and in humanitarian crises specifically, individuals face several barriers in the direction of accessing healthcare, or even to find medical care around the restricted area they have opportunity to move in (Murray and Skull 2005, 9-25). Current evidences have indicated that individuals in crises may face unique challenges in managing pain conditions, which could be exacerbated by the experience of fear, malnutrition, lack of medications and in many casesm the absent of medical workforce, and of discrimination alike (Altun et al. 2021, 1152-1169). However, addressing LBP in humanitarian crises requires a comprehensive approach considering various factors to provide effective relief and management strategies.

Many researchers confirm that exercise and planned physical activity are among the most effective resources for preventing and treating chronic non-specific low back pain (Pedersen and Saltin 2015, 1-72). Furthermore, some of them have presented their results that the lack of appropriate exercises and daily physical activity is primarily responsible for narrowing the space between the vertebrae, which leads to constant pressure on the herniated disc and nerve roots, which can cause severe back pain. Consequently, exercise and physical activity programs are the most commonly used methods for treating non-specific low back pain (Balague et al. 2012, 482-491, Falla and Hodges 2017, 105-115). Additionally, growing body of evidences indicated that exercise and physical activity programs reduce the possibility of pain returning after

recovery, reduce pain attacks, and have a major role in preventing them. They are among the most suggested therapeutic protocols in clinics and treatment and hospitalization centers, and this has been confirmed by numerous studies, including the analytical study by Sheri and Falah, which included an analysis of research papers related to lower back pain and its relationship to exercise and physical activity programs (Shiri and Falah 2017, 1410-1418). In addition, several studies, such as the study by Gina et al. (2009, 97-104) and the study by Sevgi (2016, 2727-2730), show that 90% of people with non-specific low back pain can recover without resorting to any surgical interventions. Exercises programs are used for several purposes, the most important of which are raising the level of flexibility, lengthening contracted muscles, and increasing strength, weight loss, relaxation, stimulating blood circulation in the area of pain, and reducing the percentage of fat in the intervertebral muscles. This was confirmed by the reference study by Rebecca and Saul (Rebecca and Saul 2016, 1-19), which aimed to explore the impact of back pain in society and to know The role of physical activity and exercise in treating non-specific chronic low back pain and in controlling body weight. The two researchers used the SportDiscuc, Medline, and Google Scholar databases to review 480 research papers. The study concluded that exercise programs that include Mmscular strength, stretching, and aerobic capacity which are essential in the recovery process from chronic, non-specific low back pain. Increasing general muscle strength can help support the spine in its tasks and consolidate the flexibility of muscle tendons and ligaments in the dorsal region. Therefore, developing them will increase the range of movement in various directions, which helps the patient in functional movements. In addition, the two researchers confirm that developing aerobic capacity will increase the flow of blood and nutrients to the soft tissues in the back area, which will lead to improving the healing process and reducing the stiffness and roughness that that caused by back pain. The study by Bakhtiary et al. (2005, 55-60), which aimed to know the effect of exercises directed to rebalance the tension in the muscles of the lumbar region on both sides of the spine, and to improving trunk functions in patients with chronic lumbar disc herniation. The study included (60) patients with disc herniation at the L4-L5 and L5-S1 levels. They were randomly and equally distributed into two groups. The first group performed a protocol of muscle balance exercises for the lumbar region for (4) weeks, then this was followed by rest for another (4) weeks without exercise, while the second group was in a state of complete rest without exercise for (4) weeks, then they performed the lumbar muscle balance exercises protocol for (4) weeks. The degree of pain was measured (an eleven-point graded pain test from 0-10). Moreover, the angle and measurement of raising the straight leg to the right and left, and the trunk flexion and performance of daily activities were measured before starting the study and after implementing the protocol of muscle balance exercises. The results showed that there was an improvement in all variables of the study. The researchers concluded that applying a protocol of lumbar muscle balance exercises improves the performance of daily activities in patients with chronic lumbar disc herniation. However, the study of Joseph et al. (2016, 6-19) which aimed to review the methods and results of 1,351 experimental studies or comparative and analytical studies related to low back pain. In addition, the study explored the effects of different exercise programs on the degree of pain, quality of life, and other variables such as physical performance and body composition changes among overweight and obese individuals who suffer from pain. Chronic lower back. The researchers selected sixteen (16) studies related to the variables

they had previously identified, which were based primarily on classifications of the quality of the exercise program. These studies were selected to include aerobic exercise programs, programs based on resistance strength, water exercises, and yoga exercises, which reflect the significant effects on pain symptoms, and at least one other variable, such as physical performance, perception of disability, quality of life, or body composition. The study results stated that strength-based exercise programs, water exercise programs, and yoga programs had the greatest impact in reducing the severity of pain and perception of disability, and in raising the quality of life, and in several other health variables. On the other hand, the study showed that accompanying and integrating strength-based exercise programs with water exercise programs had high-level of vital effects in improving and enhancing many health variables related to low back pain in overweight and obese individuals. It is noted from previous studies that lower back pain is closely related to body weight and to the practice of various physical activities, and that exercise programs rely primarily on strengthening, stretching, and aerobic exercises, as is the case in the current study. However, despite the use of successive studies of various protocols and types of exercises, such as strength, stabilization, flexibility, walking, activation exercises, and motor control exercises. These exercises -as a whole- aim to reduce the level of pain intensity and strengthen and stabilize the lumbosacral region, there is still no controlling and recommended protocol or type of exercises. It is included in the fields of researchers in both specific and non-specific low back pain, as each research is unique with a special program that differs in intensity and size from other programs (Shamsi et al. 2017, 42-48, Jee et al. 2019, 26).

3- Materials and methods

Data for the current study were obtained from a research project database that include monitoring several health aspects among university students (weight, health awareness, chronic diseases, and nutrition). Data was collected in 2019, after 10 years of ongoing crises. In accordance with the context and objectives of the study, a descriptive analysis method was applied to analyze the results. The study included female students from the faculties of education, law, economics, literature and science in Damascus University and in its branches. Research participants consisted of volunteered 104 female students, aged 17-29 years. participated female students were volunteered after the written announcment in mentioned colleges. Additionally, they volunteered for the study after explaining the purpose and content of the exercise program, individually or through social media apps available in the region. However, 15 female students did not complete the exercise program due to the many obstacles they encountered during the completion. Therefore, the final sample consisted of 89 female students as it presented in table (1).

Table (1): number, distribution and characteristics of the participants

College	Normal weight		Overweight		Obese		Total	
	n	%*	n	%*	n	%*	n	%**
Education	10	45.5	8	36.36	4	18.18	22	24.72
Law	9	45.0	6	30.0	5	25.0	20	22.47
Economics	5	35.7	6	42.86	3	21.43	14	15.73
Literature	10	43.5	9	39.13	4	17.39	23	25.84
Sciences	4	40.0	4	40.0	2	20.0	10	11.24
Together	38	42.70***	33	37.08***	18	20.22***	89	100

*Percentage of faculty sample

**Percentage of whole sample

***Percentage of group according to BMI classification

Data collection questionnaire that included the following information: name, residency, accessibility and availability of sporting activities in the neighborhood, age, body height, body weight, and body mass index were collected. According to Helsinki declaration, written consent was collected alike.

PI scale: The researcher used the Numerical Rating Scale (NRS), in which the student is asked to choose the number that corresponds to the intensity of the pain she is experiencing, on a scale from 0-10, where 0 means no pain and 10 means greater. Pain imaginable. Pain intensity (severity) is estimated by taking the arithmetic mean of the student's four choices, where 1-4 match moderate pain, 5-6 correspond to moderate pain, and 7-10 encounter the strongest possible pain. The statements presented to the students were: 1)- Choose the number that reflects the level of pain you are currently feeling. 2)- Choose a number that expresses the least intensity of pain you sensed during the day (24 hours) within the past week. 3)- Choose a number that expresses the worst intensity of pain you sensed during the day (24 hours) within the past week. 4)- Choose a number that expresses the average intensity of pain that you sensed during the day (24 hours) within the past week. Considering that, the NRS is extensively applied to estimate PI in hospitals and clinics with high reliability and stability, the scale's reliability coefficient (internal consistency coefficient, Cronbach's alpha) for the current study was also high (α=0.89).

Weight was measured by using portable electronic scale (Seca Scale 762) to the nearest 100 grams.. Body height was measured with Stadiometer, and taken without shoes to the nearest millimeter. Furthermore, body height was recorded after taking the average of three consecutive measurements.

Body Mass Index: was calculated via dividing the body weight (kg) by squared body height (m), applying the equation: BMI = weight (kg)/(height)^2. Interpretation of BMI values were attained according to the standards suggested by the World Health Organization (WHO, 2004, 6-13), where females body mass index between 18-24.9 considered normal, and values between 25-29.9 is overweight, and valuse equal or above 30 classified as obese.

The exercise program consists of a series of exercises including core and body weight strength exercises such as pushup, planks squats, stretching exercise at home settings, for instance, back, gluteal muscles, and hamstring stretches, and aerobic exercises including a combination of running, jogging, walking activities, proceeding in available safe neighborhood places. The exercise program extends over two months, three times a week, 24 sessions before the final evaluation, with each session lasting 60-90 minutes. Exercises and procedures were illustrated and printed in details on separate documents for each participant. Exercises that are not well known (Squats, laying thoracic Twists, side planks) were shown either individually in college's settings or through videos sent to students via social media. . Four expert professors adjudicated the exercise program (Appendix 1).

Statistical analysis

The data was analyzed by StatSoft Statistica 10 program. Arithmetic means, standard deviations, percentages, correlation coefficients, and internal consistency coefficients (Cronbach's alpha) were calculated. Student t-test to determine the difference between two groups. Significance level was set on <5%.

4- Results:

Results of the current study are presented in the order of the questions planned in the end of introduction section:

First question: What are the initial values of key variables for female university students in terms of weight classification and for the overall sample? Table (1) and Table (2) show that the percentage of college females with normal weight, which was 42.70%, those with overweight 37.08%, and for obese females was 20.22%. In addition, the results in Table (2) indicate that the level of PI among female students with normal weight can be described as moderate pain (2.84). While among those with overweight, it transfers to a moderate pain level (4.63) and among those belonging to obese category, to moderate and almost touching the level of severe pain (5.52).

Table (2): Initial means and standard deviations for body height, body weight and PI according to BMI classification.

Variable	Normal weight (n=38)	Overweight (n=33)	Obese (18)	Whole sample (n=89)
Height (cm)	165.59± 7.58	164.69± 6.38	166.09± 6.79	156.41± 6.88
Weight (kg)	63.41±11.79	76.25±8.54	87.03±9.38	75.50± 9.93
BMI (kg/m^2)	23.18±1.37	25.20±2.01	31.53±3.89	26.72± 1.89
PI	2.84±0.54	4.63±0.79	5.52±0.48	4.37± 0.62

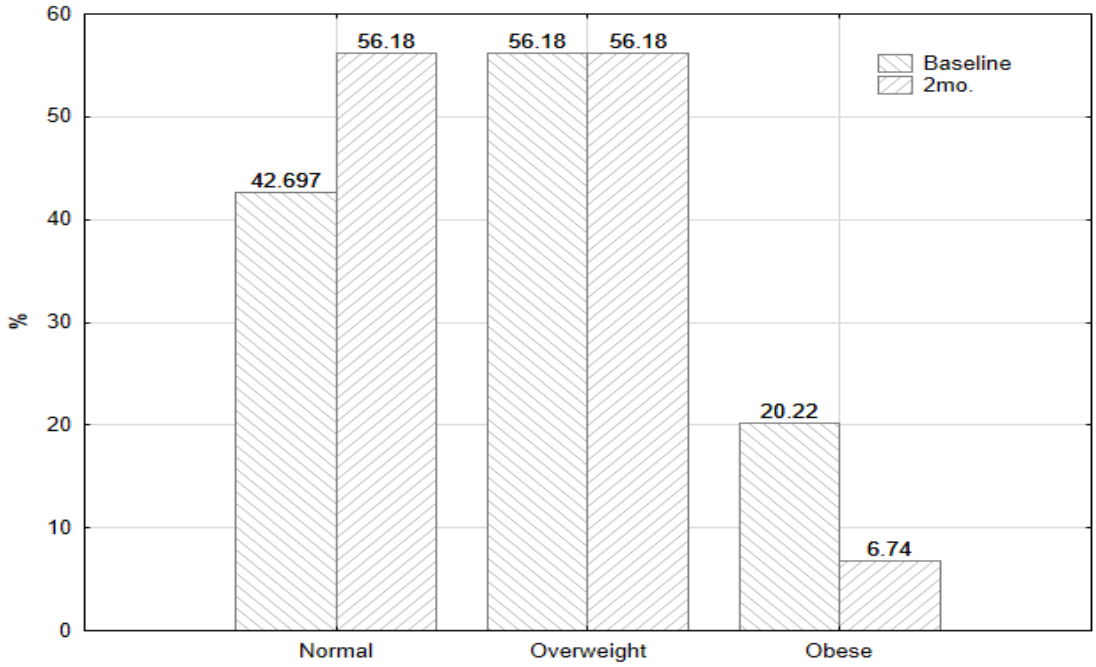
Second question: are there differences in studied variables before and after completion of the exercise program? Moreover, is the number and percentage of female students changed based on weight classification after completing the exercise program? Table (3) revealed that the statistical differences for body weight were significant for overweight (p=0.0001) and obese (p=0.0088) female students. Likewise, the difference was significant (p=0.0001) when the whole sample mean body weight was taken into consideration. On the other hand, there were no significant differences (p=0.5233) in body weight among female students belonging to normal weight category. On the topic of BMI, in resemblance with body weight outcomes, same tendency observed in table (3). The differences were significant in overweight (p=0.0089) and in obese (p=0.0001) categories, and for whole sample mean weights (p=0.0003), but not in normal weight category (p=0.0688). Regarding PI, the differences between values before and after completion the exercise program were significant for all categories, for normal weight (p=0.0001) and for overweight (p=0.0001) and for obese (p=0.0001) categories, and consequently, for the whole sample (p=0.0001).

On the topic of change in the number and percentage of female students according to weight classifications, graph (1) displayed that the percentage of normal-weight female students increased from 38 (42.692%) at the start to 50 (56.18%) after completing the program. whereas the percentage of overweight female students remained the same (33 (37.079) at the start and after completion). Furthermore, percentage of female students who belong to obese category decreased from 18 (20.22) to 6 (6.742%).

Table (3): comparative statistics of studied variables at start and after completion the exercise program

Variable	Normal weight (n=38)	Overweight (n=33)	Obese (18)	Whole sample (n=89)
Initial BW	63.41±11.79	76.25±8.54	87.03±9.38	75.50±9.93
Comp. BW	61.88±8.79	68.24±6.68	78.94±8.03	68.16±9.31
t-value (sig.)	0.641 (0.5233)	4.161 (0.0001)*	2.780 (0.0088)*	5.087 (0.0001)*
Initial BMI	23.18±1.37	25.20±2.01	31.53±2.43	26.72±3.89
Comp. BMI	22.65±1.12	24.08±1.28	28.25±2.01	24.89±2.63
t-value (sig.)	1.846 (0.0688)	2.700 (0.0089)*	4.413 (0.0001)	3.677 (0.0003)*
Initial PI	2.84±0.54	4.63±0.79	5.52±0.48	4.37± 0.62
Comp PI	2.01±0.42	3.64±0.77	4.53±0.38	3.39±0.55
t-value (sig.)	7.479 (0.0001)*	5.155 (0.0001)*	6.861 (0.0001)*	11.155 (0.0001)*

BW: body weight, Comp.: variable after completion the exercise program, PI: pain intensity, sig: significance level. *Significance at 5%.



Graph (1): Percentage of participant's according to BMI classification, before and after the exercise program completion.

Question3: Is there a relationship between pain intensity and body mass index for the total sample before and after the exercise program? The plain data in table (2), makes evident that the level of PI increases with

the augmentation in the actual value of the body mass index. Arithmetically, it was 2.84 in the normal weight category, rising to 4.63 in the overweight females, and further rising in the obese category to 5.52. Moreover, same propensity is discerned regarding the BMI-PI relationship after completing the suggested exercise program. As it presented in table (3), values of PI were 2.01 for normal weight, 4.63 for overweight, and 4.53 for obesity.

5- Discussion

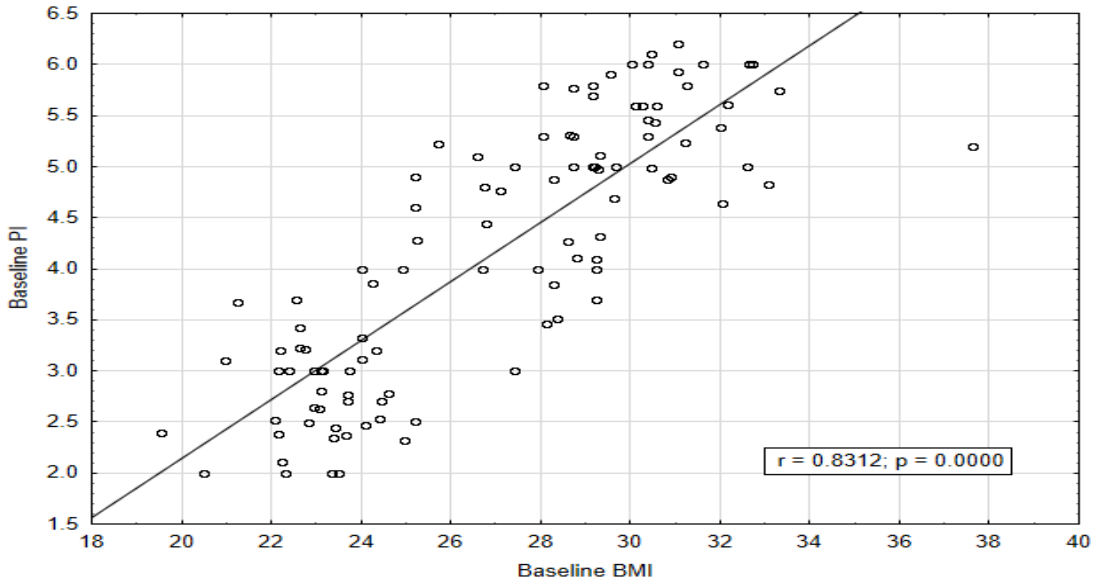
The percentages of initial body weight and BMI are close to those available from several Arab studies such as Labban study (2014, 121-127) that conducted within the Syrian university environment. The study revealed that the percentage of overweight and obese female students was (47%). In addition, Al-Arjan (2019, 2019-2036) had published similar results in Jordanian university settings, where the percentage was 53.86%. On the other hand, current results regarding overweight and obesity fluctuate from the percentage published in the study of Othman (2019, 357-392) in the same university (Damascus University), where the percentage of overweight and obese female students in Damascus University was 33.7%. The difference of percentages of overweight and obese female students in the same university may explained by the divergence of samples of the studies. While past investigation samples were comprised of general university population for both sexes, the current study limited to those female students who severe from LBP. However, several studies have mentioned that LBP is key factor of physical inactivity, sedentary life style and consequently, overweight and obesity (Stockwell et al. 2021, 7-36, Quentin et al. 2021, Rebecca and Saul 2016, 1-19). Regarding PI, our findings are in consistent with the results of previous studies that indicate the negative effects of body weight on low back pain and the severity of pain in general, that is, the greater the weight, the greater the likelihood of low back pain occurring and the higher the PI (Smuck et al. 2014, 209- 216).

The non-significant difference between bodyweights of normal weight group may became accepted, since this group of female students has a normal weight and there is no need to lose weight. Additionally, the intentional effects of the exercise program were directed towards flexibility and strengthening of the lower back muscles and headed for improving the capacity of the cardio-circulatory and respiratory system. Even though, the occurrence of differences between the two weights can be attributed to the positive, natural effects of prolonged exercise activities. (Smuck et al. 2014, Pendersen and Saltin 2015, 1-72, Joseph et al. 2016, 6-19).

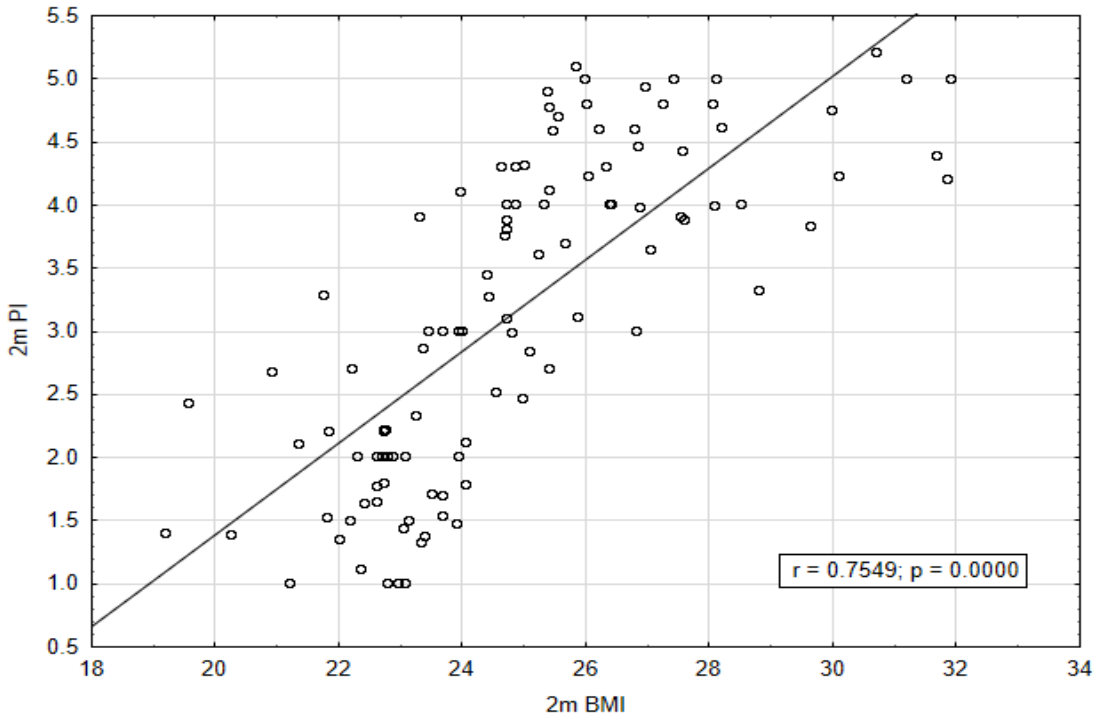
Regardless of weight classifications, the differences in PI level between the values at the start and after the completion of the exercise program were statistically significant. Hence, the suggested exercise program was competent to achieve the main goal of its implementation. These results are in consistent with the outcomes of many related research with different exercise approaches and programs (Jee et al. 2019, 26, Shamsi et al. 2017, 42-48, Shiri & Falah 2017, 1410-1418). The main difference between current and other exercise programs is that, our program was cautiously adopted in correspondence with settings and circumstances in crises.

Despite the essential changes in the studied variables, we note that the number of overweight female students did not change after the completion of the program. This result may explained by the prevailing trend among humans that they still do not belong to the category of obesity. In addition, they do not identify a motive that forces them to lose weight, despite the fact that excess weight is the stage that precedes the stage of obesity and that returning to a normal weight from this stage is much easier than returning of obesity (Heuch et al. 2015). On the other hand, the nonexistence of change in the number of overweight females before and after implementing the exercise program may attributed to the large number of obese females who moved to the lower level, to the overweight category.

On the other hand, the progression increment in PI with increased BMI values, indeed, confirm that the relationship between BMI and PI is direct. That is, the higher the body mass index, the higher the level of existed PI among female university students who suffer from non-specific lower back pain. Graph (2) illustrates this strong relationship, where value of the correlation coefficient was (r=0.8312) with a significance level of (0.0000). In similarity with values before starting the exercise program, once again, the result after completion the exercise program ratify the significant relationship. Graph (3) shows this significant relationship, where the value of the correlation coefficient was (0.7549) with significance level of (0.0000). In addition, our findings are in consistent with the majority of results of previous studies that investigated the relationship between body mass index and existed PI (Gina et al. 2009, Joseph et al. 2016, Janke et al. 2007). These studies reported that the intensity of pain increases with the increasing of body mass index value, but they did not link the lower values of BMI with a decline in PI or with the incidence of LBP.



Graph (2): Relationship between BMI and PI before starting the exercise program



Graph (3): Relationship between BMI and PI after completing the exercise program

2m PI= PI after completion of the exercise program

2m BMI= Values of BMI after completion of the exercise program

Table (3) demonstrated that the differences between the arithmetic mean values of PI at the beginning and after completing the program were statistically significant for the three groups and for whole sample (p=0.0001). Additionally, PI values decreased by a full unit (0.99) for all weight classifications and for the total sample after completing the exercise program. The decrement of PI give the prospect to conclude that the relationship between PI and exercise activity is considerable, as the implementation of the exercise program had a significant effect to reduce PI values. The reduction in PI after applying exercise programs is attributed to the therapeutic properties included in physical exercises, which are generally used in specialized clinics and treatment centers. This, with the alterations and dissimilarities existed in different exercise programs (Gina et al. 2009, Jee et al. 2019, 26).

Recommendations:

In light of the results of the current study and the results of similar previous studies, the researcher recommends the following:

1- Intensifying awareness programs within the university student community about body weight and its strong relationship with the appearance of specific and non-specific pain with aging, according to the category of weight gain and proportionality of fat mass and fat-free mass..
2- Also, intensifying awareness programs within the university student community about the importance of practicing physical activity, especially strengthening, stretching, and aerobic exercises, because of their essential role in the prevention and treatment of many disorders and syndromes, especially non-specific lower back pain.
3- Including university courses - especially in colleges of humanities - that is linked to the fundamental importance of practicing health-related physical activities. Those are linked to the prevention of posture deformities, health awareness, and nutritional awareness.

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