The Effect of Using an Exercise-Nutrition Program on Some Physiological Variables on Diabetes Patients

Sherin Hussien[1], Dina Farouk Atef Morad[1], Naglaa Mohamed Abdelhamid Ibrahim[1], Mohammed Nader Shalaby[2]

[1]Lecturer, Department of Health Sciences, Faculty of Physical Education for Girls, Alexandria University, Egypt, [2]Associate Professor of Biological Sciences and Sports Health Department, Faculty of Physical Education, Suez Canal University, Egypt

Abstract

The tremendous and astonishing technological progress in the modern era in all different fields has led to a lack of human mobility and thus a lack of physical and physiological competence, which made him vulnerable to many diseases called hypokinetic diseases such as cardiovascular disease, obesity, lower back pain, diabetes, and high blood pressure. **The Study Problem:** Diabetes is one of the most common and widespread diseases today, and failure to control this disease will lead to many complications, including cardiovascular disease, high-fat content, in addition to limb muscle atrophy, high blood pressure and peripheral nerve inflammation, which sometimes leads to leg amputation. The cause of death and this is the source of the problem. **The Study Objectives:** Knowing the blood sugar level of non-athletic patients aged 40-55 years before the program. Designing an athletic program for diabetics aged 40-55 years who are non-athletes for the research group. To know the effect of the program on blood sugar, HDL cholesterol, and PCV blood viscosity for the research group. Identify the effect of the program on the nerve signals received from the upper and lower extremities of the research group. **The study community** the human field: people with diabetes who are 40-55 years old who are not athletes. from 1/3/2020 to 1/7/2020. Hospitals and specialized centers for treating this disease and the Physiotherapy Center for Sports Medicine in Egypt. **Results:** the values of the blood sugar test indicate the significance of the differences between the pre-and post-tests and in favor of the post-test, considering that the drop in blood sugar level is a positive case. blood HDL ratio test indicates the significance of the differences between the pre-and post-tests and in favor of the post-test, considering that the drop in blood sugar level is a positive case. blood HDL ratio test considering the high level of HDL cholesterol is a positive case. **Conclusions:** 1-The diet and exercise program has a positive effect on low blood sugar levels. 2-The sports and nutritional program have a positive effect on the level of high-density lipoprotein (HDL) cholesterol in the blood. 3-The sports and nutritional program have a positive effect on blood viscosity (PCV). 4-The sports and nutritional program have a positive effect on the nerve signals coming from the upper and lower extremities.

Keywords: *Diabetes, Exercise-Nutrition Program, sugar level, cholesterol, non-athletic, blood viscosity*

Introduction

The tremendous and astonishing technological progress in the modern era in all different fields has led to a lack of human mobility and thus a lack of physical and physiological competence, which made him vulnerable to many diseases called hypokinetic diseases such as cardiovascular disease, obesity, lower back pain, diabetes, and high blood pressure Diabetes is a chronic disease that occurs due to genetic or environmental factors, which is greatly influenced by exercise, diet and lack of excessive eating, which means a lack of insulin secretion, which increases blood sugar, diarrhea, and

Corresponding Author:
Mohammed Nader Shalaby
Email: dr.m.nader@suez.edu.eg

diabetes has several types, the most common of which is What is known as the first insulin-dependent type (IDDM) and the second non-insulin-dependent type (NIDDM). Diabetes causes complications and symptoms in the arteries as there is a confirmed association between diabetes and atherosclerosis and diabetes may lead to atherosclerosis and the emergence of serious symptoms at an early age. Unusual angina or a clot in a coronary artery, or hardening of the arteries of the brain or kidneys occurs, and it also leads to pain in the extremities. It is known that peripheral nerve infections are complications and symptoms of diabetes, and the feeling of them differs from one person to another, and among the most famous of these symptoms are skin such as boils, abscesses, and fungal infections between the fingers and between the thighs [1,2].

And as we learned that diabetes causes peripheral neuropathy, which in turn will have three main effects on the lower extremities: sensory, motor, and subjective, especially if we know that the main function of the sensory nerves in the lower extremity is to act as a warning system to perceive the sense that is protective of harm and that perception The immediate sense of protection from harm is very important for healing, so the importance of research lies in identifying the effect of exercise and regular food programs on some physiological changes in diabetics that must be recognized early and protected with appropriate care, and despite all these different and different symptoms of diabetes, Among the simple diseases, if the patient, in cooperation with his specialist doctor, improves on following the diet, treatment and physical activity regimen, and in return, diabetes is the most dangerous disease if he neglects his treatment. [3–8]

Research Problem:

Diabetes is one of the most common and widespread diseases today, and failure to control this disease will lead to many complications, including cardiovascular disease, high-fat content, addition to limb muscle atrophy, high blood pressure, and peripheral nerve inflammation, which sometimes leads to leg amputation. The cause of death and this is the source of the problem. Therefore, it is imperative to use all methods and means that help to avoid complications of this disease, as sports and movement play an important and great role in the lives of sick individuals in addition to the correct diet as studies indicate that physical and movement activity With both insulin and diet, it is considered the main source for curbing diabetes, and among those methods that help to avoid complications of this disease is to use a regular exercise and diet program for people with diabetes and to know the effect of the program on some of the physiological changes associated with the disease through daily monitoring of blood sugar level or diarrhea. And examining the flow of blood through the blood vessels using modern devices, as well as recording the nerve signals coming from the brain to the limbs, so that we can know the progress of the patient.

Research Objectives:

1- Knowing the blood sugar level of non-athletic patients aged 40-55 years before the program.

2- Designing an athletic program for diabetics aged 40-55 years who are non-athletes for the research group.

3- To know the effect of the program on blood sugar, HDL cholesterol, and PCV blood viscosity for the research group.

4- Identify the effect of the program on the nerve signals received from the upper and lower extremities of the research group.

Research Hypotheses:

1- The program has a positive effect on blood sugar level, an increase in HDL cholesterol, and blood viscosity (PCV).

2- The program has a positive effect on the nerve signals received from the extremities.

Research Areas:

1- The human field: people with diabetes who are 40-55 years old who are not athletes.

2- Time-domain: from 1/3/2020 to 1/7/2020.

3- Spatial domain: Hospitals and specialized centers for treating this disease and the Physiotherapy Center for Sports Medicine in Egypt.

Diet for Diabetics:

Diet is an essential pillar for controlling diabetes, whether the patient is treated with diet only, tablets, or insulin injections. The doctor or dietitian often organizes a specific diet program that is determined according to the patient's age, weight, height, degree of movement activity, and the type of sugar, so that the nutritional program is varied, taking into account the ease of choosing different food items that suit the patient's local and personal dietary pattern [17–20]. The patient should take into account the following things to reduce blood sugar levels:

1- The food should be varied and complete, the proportion of carbohydrates in it 50-60% of the daily calories needed, proteins 15-20%, and the rest of fats

2- Regularly eating meals on time, so that they are three main meals.

3- Avoid eating large amounts of food at the same meal

4- That the food is eaten is approximately equal in quantity every day

5- Avoid eating sugar-sweetened foods such as juice, chocolate, Halawa, jam, molasses, candy, and Arabic sweets.

6- It is advisable to eat more foods that contain a high percentage of fiber, as it is absorbed slowly from the digestive system and helps to avoid a sudden rise in blood sugar. These foods include vegetables, legumes, grains with their skin (brown bread), and most fresh fruits

7- It is recommended to replace animal fats with vegetable oils to avoid high blood fats to prevent heart disease and atherosclerosis [20–23].

Research methodology and field procedures

1-Research Methodology:

The researcher used the experimental method as it is the most suitable method for solving the research problem

(One group method).

2-Research Sample:

The research sample was selected randomly for diabetics who were not completely insulin-dependent and whose ages ranged between 40-55 years and from males with this disease. The sample is 20 patients, and it is finally ready to implement the required training and food program. The researcher found the average ages, lengths, and weights of the samples as shown in Table (1).

Table (1): It shows the mean and standard deviations of height, weight, and age

Variables	Mean	SD
Age	48.11	5.55
Length	172.1	6.26
the weight	81.8	8.75

Search tools, devices, and utilities:

1-Research Tools:

1- Testing and measurement.

2- The interview.

2-Assistive devices and tools:

1- Doppler, a French-made device.

2- A German-made EMG, EEG (to measure the speed of nerve impulses).

3- Chemicals.

4- Pressure test device.

5- Syringes to draw blood 5 cm.

6- Bottles to hold blood samples with a volume of 10 cm.

7- A German-made micropipette.

8- An English-made photometer.

9- Sports equipment.

10- Electronic scale to measure height and weight.

11- Registration forms.

Field research procedures:

Filtering of sports exercises and nutrients for the sports and food program:

After reviewing many sources and references and conducting interviews with experts regarding exercise and foodstuffs that benefit diabetics, several exercises that help reduce blood sugar levels, in addition to appropriate nutrients for diabetics, have been selected.

Preparing the sports and nutritional program:

After the sports and nutritional program was designed and after presenting it to some of the specialists who were mentioned on the previous page in the sports and medical side to evaluate it in terms of the vocabulary it contains and the extent of its suitability for the research sample and the stresses contained in the program and the extent of the ability to apply exercises, especially since they are diabetic and so that we can achieve The desired goal was the specifications of the sports program as follows ...

· The period of the program lasted about (12 weeks) of training, at the rate of (3 training units) for each week and the days of Saturday - Monday - Wednesday.

· Total training units (36 training units).

· The time of one training unit (45 minutes).

· As for the method of administering the program, the researcher relied on the method of gradation in intensity.

While the nutritional program came parallel to the athletic program, see Supplement (2) the nutritional program.

Exploratory Experience:

The researchers conducted the exploratory experiment before starting the original experiment to control the measurement variables and identify the obstacles facing the researcher during the research period, starting from taking blood samples and measuring some physiological variables represented (high-density HDL cholesterol, PCV blood viscosity, neurological instructions coming from the limbs, and the percentage Blood sugar) and the extent of patients' acceptance of exercise, the availability of devices, their validity, and the ability of the assisting team to implement the program, so the experiment was conducted on 1/3/2020 at 10 am on 3 NIDDM types II diabetics. And to ensure the accuracy of the laboratory results obtained, the test was repeated after 7 days under the same conditions, and indeed the results were identical accurately.

Pre-Exams:

The tests are among the most important methods used in scientific research, using which the necessary information for scientific progress is collected [(9)]. The following tests were carried out on the research sample in the laboratories of Hospital in Egypt, namely (fasting blood sugar, HDL cholesterol, PCV, blood viscosity, the nerve signals received from the parties) on 12/3/2020 at ten in the morning, without eating breakfast.

Post Tests:

After completing the application of the sports and nutritional program, the post-tests were conducted in the same place and time and under the same conditions in which the pre-tests were conducted on 17/6/2020, and these results were taken to conduct the appropriate statistical treatments.

Statistical methods:

- Mediator
- Spring deviation
- Wilcoxen's test

Presentation, analysis, and discussion of the results:

Presentation, analysis, and discussion of the results of sugar, HDL, and PCV of the research sample:

Table (2): It shows the pre-and post-tests of the median, the spring deviation, and the Wilcoxen test of the research sample for the ratio of sugar, HDL, and blood viscosity ratio (PCV) in diabetics

Variables	Pretest		Post-test		Wilcoxen value		p-value	significance level
	Median	Interquartile Range	Median	Interquartile Range	Calculated	Tabular		
Blood sugar level	177	1	103	1	0	8	0.05	significance
HDL blood level	22	2	28	1	1	8	0.05	significance
Blood viscosity ratio	50	1.5	45	0.75	0	8	0.05	significance

Measuring unit: mg / 100 ml

From Table (2) it can be seen:

In the blood sugar test: the median of the research sample for the pretest test reached (175) with a spring deviation of (1), while the median in the post-test reached (105) and a spring deviation of (1) and the calculated Wilcoxen value was (zero), which is less than the tabular value The amount (8) is at the level of significance (0.05) and in front of the sample size (20), which indicates the significance of the differences between the pre and post-tests and in favor of the post-test, considering that the drop in blood sugar level is a positive case.

In the blood HDL ratio test: the mean of the research sample in the pretest was (21) with a spring deviation of (2), while the mean in the post-test reached (27) and a spring deviation of (1) and the calculated Wilcoxen value was (1), which is less than the value The tables and amounts (8) at the level of significance (0.05) and in front of the sample size (20), which indicates the significance of the differences between the pre and post-tests and in favor of the post-test, considering the high level of HDL cholesterol is a positive case.

In the PCV test: the median of the research sample for the pretest test reached (48) with a spring deviation of (1.5), while the mean in the dimensional test was (46) and a spring deviation of (0.75) and the calculated Wilcoxen value was (0) It is less than the tabular value of (8) at the level of significance (0.05) and in front of a sample size (20), which indicates the significance of the differences between the pre and post-tests and in favor of the post-test because the decrease in blood viscosity means a positive condition. The tests indicated that there is a reciprocal effect between what has been achieved of the quantities of development in the level of sugar, HDL, and PCV in the blood, which were caused by the sports and nutritional program prepared by the researcher based on age and type of diabetes, which included a clear decrease in the concentration of these two substances in the blood, as most studies and specialized research indicated that I studied the effect of exercise and nutritional programs on diabetics and their effect on reducing blood sugar levels. Participation in regular exercise leads to a reduction in insulin needs and an increase in the sensitivity of cells to insulin in diabetics and normal people by increasing receptors. Insulin

"studies also indicated that the diet has a clear link with diabetes, as" avoiding excessive food and adhering to specific food quantities by a nutritionist helps to regulate blood sugar and without it, diabetes cannot be controlled and its possible complications avoided "[16], as he sees Some researchers believe that exercise and nutritional programs greatly help to regulate blood sugar, reduce harmful fats, and increase High-density fats that protect against heart disease, atherosclerosis, reduce blood pressure, and most importantly of all, increase the effectiveness of insulin. When exercising, the effect of insulin on muscle tissue improves, thus increasing the consumption of blood sugar, as well as the effect of insulin on the liver increases and the rate of sugar release from it decreases [4,12] Some scientists also confirmed that practicing sports activity and following an organized diet leads to reducing the risk of developing atherosclerotic diseases caused by high blood sugar to an abnormal limit [11,13] and that increasing the level of HDL in the blood of the research sample works on the reverse transfer of cholesterol in the tissues to the liver to be Disposal, and that this increase means the positive relationship to the practice of sports activity [17,18] , and the lack of sources for the variable PCV blood viscosity, especially in the sports field, the researcher called for an explanation of the reason for the low blood viscosity in diabetics, which is the result of a decrease in the proportion of low-density harmful fats and an increase in high fats The density that protects against heart disease, atherosclerosis, lowers blood pressure, and most importantly of all, increases the effectiveness of insulin and smooth blood flow in blood vessels without p Fit.

Presentation, analysis, and discussion of the results of the speed of nerve impulsion in the middle sensory and motor nerve of the upper limb:

Table (3): It shows the pre-and post-tests of the median, the spring deviation, and the Wilcoxen test of the research sample for the velocity of nerve impulse in the sensory and average motor nerve of the upper extremity in diabetics

Variables	Pretest		Post-test		Wilcoxen value		p-value	significance level
	Median	Interquartile Range	Median	Interquartile Range	Calculated	Tabular		
The median sensory nerve (latency)	3.85	0.25	2.5	0.25	2	8	0.05	significance
The median sensory nerve (velocity)	28	2.5	45.5	2.5	0	8	0.05	significance
The median motor nerve (Latency)	4.5	2.5	3	0.25	1	8	0.05	significance
The median motor nerve (Velocity)	22	3	49	1.5	0	8	0.05	significance

Measuring unit: the mm \ s sensory nerve - the mm motor nerve.

From Table (3) it can be seen:

- In the test of the signal velocity of the median sensory nerve of the upper limb: the mean for the pre-test was (3,75) with a spring deviation of (0.25), while the mean for the post-test was (2.5) and with a spring deviation of (0.25), while the calculated Wilcoxen value was (2) and it is less than the tabular value of (8) at the level of significance (0.05) and in front of the sample size (20). This indicates the significance of the differences between the pre-and post-tests and in favor of the post-test, considering that the decrease in values means increasing the speed of instruction Nervous.

In the velocity test of the median sensory nerve signaling: Velocity

The mean in the pre-test reached (27.5) with a spring deviation of (2.5), while the mean in the post-test reached (45) and a spring deviation of (2.5). As for the calculated Wilcoxen value, it was (zero) which is less than the value Table (8) at the level of significance (0.05) and in front of sample size (20). This indicates the significance of the differences between the pre-and post-tests and in favor of the post-test.

Latency Test:

The mean in the pre-test reached (4) with a spring deviation of (0.25), while the mean in the post-test reached (2.5) and a spring deviation of (0.25), while the calculated Wilcoxen value was (1), which is less than the tabular value The amount of (8) is at the level of significance (0.05) and in front of the sample size (20) and since the calculated value is less than the tabular, this indicates the significance of the differences between the pre and post-tests and in favor of the post -Test because the decrease in the values indicates an increase in the speed of the nerve impulse in the average motor nerve.

Velocity Test:

The mean in the pre-test reached (20) with a spring deviation of (3), while the median in the post-test reached (47.5) and a spring deviation of (1.5) and the calculated Wilcoxen value was (zero), which is less than the tabular value of (8) At the level of significance (0.05) and in front of the sample size (20), and when the calculated value is less than the tabular, this indicates the significance of the differences between the pre and post-tests and in favor of the post-test because increasing the values means increasing the speed of the nerve impulse.

Presentation, analysis, and discussion of the results of the speed of nerve impulsion in the sensory and motor nerve of the lower extremity:

Table (4): It shows the pre-and post-tests of the median, the spring deviation, and the Wilcoxen test of the research sample for the speed of nerve stimulation in the sensory and motor nerves of the lower extremity in diabetics

Variables	Pretest		Post-test		Wilcoxen value		p-value	significance level
	Median	Interquartile Range	Median	Interquartile Range	Calculated	Tabular		
Sensory nerve (Sural \ Latency)	5	0.5	3	0.25	1.5	8	0.05	significance
Sensory nerve (Velocity \ Sural)	26	2	47	2	0	8	0.05	significance
Posterior tibial motor nerve (Latency)	5	1	2.5	0.5	1	8	0.05	significance
Posterior tibial motor nerve (velocity)	3.5	1.5	2.5	0.25	0	8	0.05	significance
Common fibular motor nerve (Latency)	5	1	3	0.25	0	8	0.05	significance
Common fibular motor nerve (Velocity)	4.75	0.75	2.75	0.5	1	8	0.05	significance

From Table (4) it is found:

In the Sural Latency test for the lower extremity:

The mean for the pre-test for the research sample was (4) with a spring deviation of (0.5), while the mean for the post-test was (2.75) and a spring deviation of (0.25), while the calculated Wilcoxen value was (1.5), which is less than the value. Table (8) is at the level of significance (0.05) and in front of the sample size (20). This indicates the significance of the differences between the pre-and post-tests and in favor of the post-test because the decrease in the values means an increase in the speed of the nerve impulse.

Sural / Velocity nerve stimulation test:

The median in the pre-test of the research sample reached (25) with a spring deviation of (2), while the median in the post-test reached (46) and a spring deviation of (2) and the calculated Wilcoxen value was (zero) which is less than the tabular value of (8) at the level of The significance of (0.05) and in front of the sample size (20), which indicates the significance of the differences between the pre and post-tests in favor of the post-test, given that the increase in the values indicates an increase in the speed of the nerve impulse in the sensory nerve.

Latency Test:

The mean in the pretest was (3,5) with a spring deviation of (1.5), while the mean in the post-test was (2.25) and a spring deviation of (0.25). As for the calculated Wilcoxen value, it was (1), which is less than the tabular value of (8) at the level of significance (0.05) and in front of the sample size (20), which indicates the significance of the differences between the pre-and post-tests and in favor of the post-test.

Velocity testing of the nerve signaling of the posterior bronchial motor nerve:

The mean in the pre-test reached (3.5) with a spring deviation of (1.5), while the mean in the post-test reached (2.25) and a spring deviation of (0.25). As for the calculated Wilcoxen value, it was (zero), which is less than the tabular value of (8) at the level of significance (0.05) and in front of the sample size (20), which indicates the significance of the differences between the pre-and post-tests and in favor of the post-test.

Latency Test:

The mean in the pre-test reached (4.5) with a spring deviation of (1), while the mean in the post-test reached (2.75) and a spring deviation of (0.25). The calculated Wilcoxen value was (zero), which is less than the tabular value of (8) At the level of significance (0.05) and in front of the sample size (20), this indicates the significance of the differences between the pre-and post-tests in favor of the post-test.

Velocity Test:

The mean in the pre-test reached (4.25) with a spring deviation of (0.75), while the mean in the post-test reached (2.5) and a spring deviation of (0.5). As for the calculated Wilcoxen value, it was (1), which is Less than the tabular value of (8) at the level of significance (0.05) and in front of the sample size (20), which indicates the significance of the differences between the pre-and post-tests and in favor of the post-test. Through the previous two tables, these tests represent the patient's special abilities in limb mobility the upper and lower extremities, which were affected greatly by the aerobic exercises and the nutritional program that the research sample followed and placed by the researcher, had a clear effect on increasing the speed of nerve signals to the lower and upper extremities, which was confirmed by many studies that "the reason behind nerve damage is due to the increase in blood sugar. Which damages the wall of the blood vessels that supply the nerves, and that the symptoms that occur depend on the type of nerve that the injury occurred to, and in most cases the injury occurs in the sensory nerve in the legs and sometimes the arm, as a result of diabetes "[7,27,28], and the high blood sugar for a long period leads to morbidity Sensory and motor neurosis as a result of the formation of harmful substances to these nerves, as well as due to the impact of the small blood vessels that feed these nerves, and this causes a lack of perfusion to these nerves and thus to their damage [7,26,27]. Also, the development occurring in the speed of nerve impulses Sensory and kinesthetic in the dimensional tests came in line with the statistically significant development of blood sugar that was previously discussed, and it is known that neuropathy is a difficult problem in the treatment of diabetes and

it is difficult to describe exercise. This is because the physiological changes associated with exercises such as high blood pressure and acceleration of the heartbeat depend on the integrity of the nerves, and therefore it may disappear in patients with diabetes. Baths or similar places, where the average person depends on these symptoms to feel tired during exercise and thus stop the exercise. The absence of it in diabetics removes this beneficial feeling [14,15,31].

Conclusions and Recommendations

Conclusion:

the researchers came up with the following conclusion:

1- The diet and exercise program has a positive effect on low blood sugar levels.

2- The sports and nutritional program have a positive effect on the level of high-density lipoprotein (HDL) cholesterol in the blood.

3- The sports and nutritional program have a positive effect on blood viscosity (PCV).

4- The sports and nutritional program have a positive effect on the nerve signals coming from the upper and lower extremities.

Recommendations:

In light of the results reached by the researchers regarding his research topic, the researchers recommend the following:

1- The necessity of education and education on the importance of regular exercise for diabetics.

2- Emphasis on following a suitable diet, especially for overweight people, to reduce weight and thus reduce blood sugar levels.

3- The necessity of self-monitoring of sugar at home and laboratory tests of the patient to avoid an increase in the level of sugar and its risks.

4- Emphasis on the use of aerobic exercises in the treatment of diabetics.

5- Seeking to conduct similar research in which it deals with the effect of exercise on the vision for diabetics.

Conflict of Interest: Nil

Source of Funding: Self

Ethical Clearance: Obtained from the departmental committee

References

1. Aylward GW. Progressive changes in diabetics and their management. *Eye*. 2005;19(10):1115-1118.
2. Yki-Järvinen H, DeFronzo RA, Koivisto VA. Normalization of insulin sensitivity in type I diabetic subjects by physical training during insulin pump therapy. *Diabetes Care*. 1984;7(6):520-527.
3. Shalaby MN, Liu JY, Kassem MM, Saad M. Circulating Hematopoietic Stem Cell and Some Physiological Parameters in Different Training Programs. *Life Sci J*. 2012;9(1):965-971.
4. Shalaby M, Sakoury MMA, Harthi SM, et al. Vitamin D3 for Health and Muscle Functions of Athletes. *Syst Rev Pharm*. 2020;11(9):851-854.
5. Shugart C, Jackson J, Fields KB. Diabetes in sports. *Sports Health*. 2010;2(1):29-38.
6. Ghanem Ha, Muhammad Ghah. The effect of some rehabilitative exercises on the circumference of the abdomen after a cesarean delivery. J Phys Educ. 2015; 27 (3): 245-259.
7. Thomas DT, Erdman KA, Burke LM. Position of the Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine: nutrition and athletic performance. *J Acad Nutr Diet*. 2016;116(3):501-528.
8. Swarbrick MM, Havel PJ. Physiological, pharmacological, and nutritional regulation of circulating adiponectin concentrations in humans. *Metab Syndr Relat Disord*. 2008;6(2):87-102.
9. Mahmoud EA, Al-Bakri NA, Qasim BJ. Histopathological changes of placenta in pregnant women complicated with pregestational diabetes. *J Pharm Sci Res*. 2018;10(11):2952-2959.
10. Gamil GEE, Dokki G-E. Gamal El Din Esmat Gamil. Published online 1990.
11. Shalaby MN, Saad MM. Advanced Material Engineering and Nanotechnology for Improving Sports Performance and Equipment. *Int J Psychosoc Rehabil*. 2020;24(10).

12. NaderShalaby M, Liu JY, Heshmat H, Shalaby NM, Salah M. The Effect of Aerobic and Anaerobic Exercise Bouts on CD34+ Stem Cells and Some Physiological Parameters. *Life Sci J*. 2012;9(2):1037-1043.
13. Shalaby MN, Saad M, Akar S, Reda MAA, Shalgham A. The Role of Aerobic and Anaerobic Training Programs on CD34+ Stem Cells and Chosen Physiological Variables. *J Hum Kinet*. 2012;35(1):69-79.
14. Shalaby MN, Sakoury MMA, Hussien S, et al. The Effect of Using a Suggested Sport's Diet on Increased Thyroid Secretion and Its Effect on Obesity. *Syst Rev Pharm*. 2021;12(1):805-817.
15. El-Naggar ME, Al-Joufi F, Anwar M, Attia MF, El-Bana MA. Curcumin-loaded PLA-PEG copolymer nanoparticles for treatment of liver inflammation in streptozotocin-induced diabetic rats. *Colloids Surfaces B Biointerfaces*. 2019;177:389-398.
16. Chipkin SR, Klugh SA, Chasan-Taber L. Exercise and diabetes. *Cardiol Clin*. 2001;19(3):489-505.
17. Sakoury MMA, Shalaby MN, Elmaghraby AM, Omar IM, Tahoun MMA. The effectiveness of a water sports program on the level of poly unsaturated fatty acids and the severity of the disease in children with Autism spectrum disorder. *Med Sci*. 2020;24(101):143-164.
18. Shalaby MN, Sakoury MMA, Alghamdi AM, Alzayani AK, Reem A-D. The effects of Exercise Program and Dietary Supplement on the Efficiency of the Dynamic System in Old Females. *PalArch's J Archaeol Egypt/Egyptology*. 2020;17(4):739-756.
19. Ramadan AM, El-Ruby AE-RA. The effect of a Proposed Program of Modified Tae Bo Exercises on the level of Some Physical Fitness, Physiological and Skillful Elements of Basketball Players. *Assiut J Sport Sci Arts*. 2019;119(1):1-20.
20. Lokesh K. *Methodology of Educational Research*. Vikas Publishing House; 1984.
21. Shalaby MN, Fadl MA. A Proposed Training Program And Its Effect On Muscle Strength Responses And Some Physiological Variables For Volleyball Beginners. *Syst Rev Pharm*. 2020;11(12):515-519.
22. Shalaby MN, Fadl MA. Relative Indicators and Predicative Ability of Some Biological Variables on Cardiac Neural Activity for Volleyball Players. *Syst Rev Pharm*. 2020;11(9):834-840.
23. BAGHDAD SMSIN. The Swedish Journal of Scientific Research (sjsr) ISSN 2001-9211. Volume 3. Issue 4 April 2016.
24. Mohammed SGS, Abdallah FAA. Nutritional Status and Quality of Life among Hemodialysis Patients in Omdurman Military Hospital (Hemodialysis Center)(November 2017-March 2018). *Clin J Nutr Diet*. 2019;2(1):1-8.
25. Shalaby MN, Kholif MA, El Sayed KAEM. Effect of Using Some Methods of Hospitalization on The Speed of Return to Normal and Some Physiological Variables for Volleyball Players. *Syst Rev Pharm*. 2021;12(3):448-455.
26. Culic VC, Van Craenenbroeck E, Muzinic NR, et al. Effects of scuba diving on vascular repair mechanisms. *Undersea Hyperb Med*. 2014;41:97-104.
27. Shalaby MN, Sakoury MM, Kholif MA, Alsayed NI. The role of Amino Acids in improving immunity and growth factors of Volleyball players. *J Adv Pharm Educ Res Oct-Dec*. 2020;10(4):141.
28. Shalaby MN, Liu JY, Saad M, Elaraby H. Impacts of Different Exercise Intensities on Hematopoietic Stem Cells and Certain Physiological Parameters on Handball Players and Non-Athletes. *Life Sci J*. 2012;9(3):2100-2105.
29. Peng H, Zhou Y, Zhang C, et al. An accurate and dual-effective body slimming method through a soluble microneedle patch with variable temperature. *J Mater Chem B*. 2021;9(2):421-427.
30. Taan SR. Running exercises (200 meters) and their contribution to some of the chemical-related signs related to the hardness of their bones. Published online 2020.
31. Minuk HL, Vranic M, Marliss EB, Hanna AK, Albisser AM, Zinman B. Glucoregulatory and metabolic response to exercise in obese noninsulin-dependent diabetes. *Am J Physiol Metab*. 1981;240(5):E458-E464.