

Physical activity as an important factor in preventing osteoporosis

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ABSTRACT

Aim Beside its educative aspect, this study aimed to point out the possibilities in suppression of osteoporosis through physical activity.

Methods 25 osteopenia patient were included in the study. The patients were advised to undertake regular physical activity consisting of the therapeutic exercises combined with the Pilates exercises. First, an estimate of the physical condition of the subjects was made and an appropriate physical exercise program was formulated for each patient. The patients executed the assigned exercise program three times a week for 45 minutes for 12 months, after which period the HAQ questionnaire was re-administered.

Results At the start 68% subjects had significant difficulties with getting up, walking, performing household chores and maintaining hygiene. The remaining 32% required assistance to perform the above activities. Of 17 (68%) subjects with significant difficulties with getting up, 14 (56%) improved to be able to perform the activity independently. Of 24 (96%) subjects with significant difficulties with maintaining hygiene, at the end 8 (32%) were able to perform the activity without any difficulties. Of 18 (72%) subjects that had difficulties in performing the everyday household chores, at the end 7 (28%) were able to perform the activities without any help. Of the 18 (72%) subjects with significant difficulties with walking, 7 (28%) were able to perform the activity without difficulties at the end of the study.

Conclusion Physical activity is an important factor in prevention of osteoporosis. Prevention should start in childhood with continued physical activity throughout the life.

Key words: physical inactivity, osteoporosis, education.

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INTRODUCTION

Due to advances in medicine, human life span has significantly extended. In the early 20th century an average human life span was around 50 years, while today people live an average of 75 years. When gender differences are considered, the studies show that females live on average 5-10 years longer than males (1). Some studies have shown that not only older age but more importantly insufficient level of daily physical activity is often associated with diseases. It is also seen as an important factor to the occurrence of chronic conditions (2). Unlike physical inactivity, physical activity is a biologically important stimulus for maintaining the structure and function of organs and organ systems (3). Even in ancient Greece, Plato emphasized the importance of moderate physical activity in prevention of disease and speculated that it can even help to slow down aging (4). Only thirty years ago, osteoporosis was considered an undesirable, but typical, and largely unavoidable consequence of aging, as aging indeed coincides with the loss of bone tissue at the level of about 3% in males, and about 8% in females (5). Osteoporosis is among the five most prevalent chronic diseases, and a number of causes and risk factors have been indicated in conjunction with the disease (6). According to the definition of the World Health Organization (WHO), osteoporosis is a disease characterized by reduced bone mass and abnormality in bones' microstructure that can result in bone fractures (7). More recently physical inactivity has been indicated as one of the key factors leading to reduced bone mass (8). The development of osteoporosis, and in the most severe cases the appearance of osteoporotic fractures, has been observed to occur at an increasing rate in the developed and developing countries around the world. This increase in occurrence has been linked to the declining rate of physical activity (9).

It is concerning that about 25 million people in the US, of which 80% are females older than 50, are affected by osteoporosis (9, 10). The studies done by some global experts show that osteoporosis can be associated with 1.5 million fractures annually in developed countries, and that its effects often pose a major health and economic problem, both for the individuals and for the society as a whole (11,12) In the modern way of life, nearly every possi-

ble form of regular everyday physical activity gets replaced by a machine or a robot assisted activity. That leads to significant reduction in physical activity and consequently can lead to the development of osteoporosis. According to the statistics coming out of some recent studies, the inactivity to osteoporosis problem may become one of the most important issues as a significant public health problem of the developed world (13).

Beside just an educational aspect, the aim of this work is to explore the possibility and efficacy of osteoporosis prevention through physical activity, the health condition to which WHO devoted an entire decade.

PATIENTS AND METHODS

A clinical research was conducted at the College "Lavoslav Ružička" in Vukovar in the period from January 2011 to January 2012. The study was based on monitoring of a group of 25 females, 55-60 years old, of which 17 (68%) had displayed difficulties in performing everyday activities. The individuals had been diagnosed with osteopenia, and all of them had been recommended to perform a regular, moderate physical activity as a part of their disease management. The patients were assigned to one of the three groups to perform therapeutic exercises for 45 minutes three times a week. The exercises were carried out in conjunction with the Pilates exercises, under the supervision of a physiotherapist and a Pilates instructor. For each participant, individual physiotherapeutic assessment was performed as a baseline and repeated every 2 months during this one-year study. The physical therapy evaluation included measurement of height and weight, posture assessment, coordination assessment, evaluation of movements (locomotion) and balance, assessment of walk characteristics, functional assessment, manual muscle test of large muscle groups, evaluation of index sagittal mobility of spine, and the measurement of breathing index. Additionally, HAQ-questionnaire (14, 15), which is a standard questionnaire in clinical rheumatology, was used to assess functioning level of patients in their everyday life. The questionnaire inquires about the ability of a subject to execute activities independently or with external assistance. The specific activities about which the subjects are inquired were dressing up, maintaining hygiene, getting up from bed or chair, food intake

ke, walking, reaching for items, receiving and opening of items, as well as other typical minor household chores. For the purpose of this study we administered the questionnaire and collected and processed data that investigated the change between the baseline (starting point) and the end test point. Based on the baseline data obtained, a plan was made, according to which the patients later carried out the exercise. The test found a clear improvement for the following activities: getting up, personal hygiene, performing household chores and walking. The study subjects gave an informed written consent to participate in the research study, for the researchers to take measurements and conducts tests, as well as the consent that the results of the study can be published. The ethical and scientific aspect of the study had been approved by the Ethics Office of the “Lavoslav Ružička” College in Vukovar.

RESULTS

This research was conducted with the aim of evaluating effectiveness of the exercise program approach in helping osteoporosis patients to stop progression of the symptoms and to regain ability, at some level, to conduct regular life and perform daily activities currently impacted by the disease. The purpose of this study was to improve functional ability and quality of life for females with osteoporosis.

None of the patients followed in this study showed significant differences between the initial and the final evaluation time point in the assessment of posture, sagittal mobility index, or the breathing index. However, some changes have been observed in the functional ability of the patients in the following activities: getting up out of bed or a chair, personal care, housework and when walking on the stairs.

The initial evaluation found that 17 (out of 25, 68%) patients had noticeable difficulties to get up, with the other eight (out of 25, 32%) showing slightly less difficulties (as being able to perform the activities with some assistance, e.g. by supporting herself by holding onto a bed or a chair).

After one year of the regularly conducted exercise, the study reveals that 14 (out of 25, 56%) were able to perform the activities without difficulty, three (12%) were able to perform the activities with some help and eight (32%) remained to have significant difficulties in performing the activities (Figure 1).

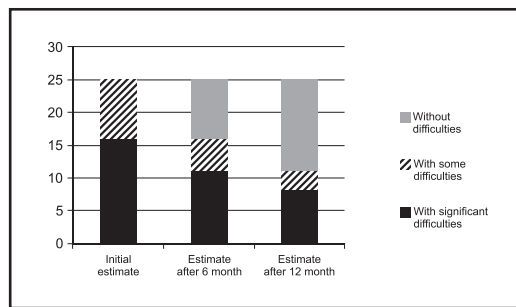


Figure 1. The results of the HAQ questionnaire given to the subjects with respect to the ability to stand up

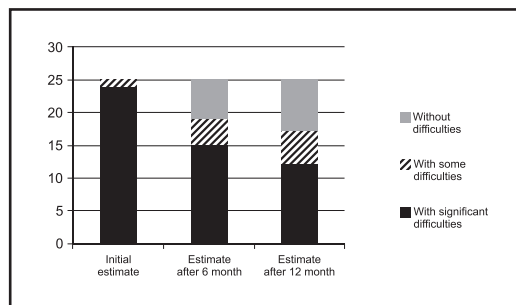


Figure 2. Results of the HAQ questionnaire input about ability of 25 patients to perform their personal care independently at three time points, mid time point and at the end of the study

The testing of regular, everyday personal care activities (such as bathing, hair washing, etc.) showed that 24 (out of 25, 96%) patients performed the activities with much difficulty at the starting point of the physical therapy evaluation. However, at the end of the study, it was noted that 12 (48%) patients still performed with much difficulty, five (20%) with some assistance and eight (32%) without difficulty at all (Figure 2).

Furthermore, the study participants were observed for their ability to perform some of the common everyday household chores such as housekeeping, cooking, ironing, procuring food and similar. At the baseline time point, 18 (72%) patients responded that these activities were done with much difficulty, and seven (28%) characterized them as done with some difficulty. The final assessment showed that seven (28%) patients performed the above listed activities without difficulty, nine (36%) with some difficulty, and nine (36%) responded to continue to have significant difficulty in performing the above household activities (Figure 3).

Our initial assessment of the patients' condition showed that 18 (72%) had significant problems, e.g. difficulties with walking and

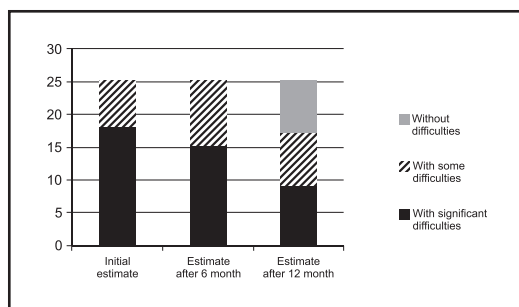


Figure 3. Results of the HAQ questionnaire on the ability of the subjects to perform the usual housework activities

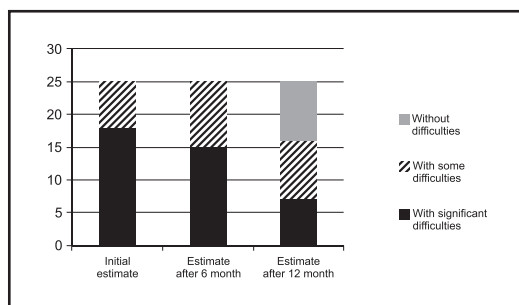


Figure 4. Results of the HAQ questionnaire on the ability of the subjects to perform active walking

the presence of pain. Seven (28%) patients had less difficulty, but displayed fast fatigue. Our final assessment, 12 months later, showed that nine (36%) patients still displayed significant difficulties with the activity, nine (36%) still had some difficulty and seven (28%) patients after the completion of treatment were able to carry out the walking activity without difficulty (Figure 4).

DISCUSSION

The study included 25 osteopenia patients, 55-60 years old, of which 68% had the difficulties in getting up from bed and/or need for assistance in erecting from a sitting to a standing position were noted. At the conclusion of the study period 56% subjects were able to perform the indicated activities without difficulties, which has shown a benefit of maintaining physical activity. The importance of physical activity as a way of prevention and combating osteoporosis is stressed in the research literature (16).

At the beginning of the study 96% of the subjects showed significant difficulties in independent maintenance of personal hygiene, however, after 12 months of participation in the exercise program 20% of the subjects were able to perform the activities with some assistance and 32% without any assistance. Also, 72% subjects had had significant difficulties to perform everyday house chores at the beginning, while at the end of the study 36% had minor difficulties and 28% were able to perform the activities without any difficulties. Even though the literature is not entirely conclusive in what way physical activity impacts strengthening of bone mass (17), the positive improvement was noted in the study and it showed that 36% subjects felt only minor tiredness after longer walks and 28% had no more difficulties walking.

According to the results of this study there is evidence that despite advances in the treatment and the emergence of new drugs for osteoporosis, the focus of the effort should be on prevention or at least mitigation of the problems when the disease occurs (18). Specifically, we believe the mitigation could be achieved through implementation of regular exercise as a cost effective and efficient measure that does not have side effects of drugs or surgical treatments. In an ideal case, a preventive effort in suppressing osteoporosis could be started at young age and continued through regular physical activity later on since bone formation extends into thirties, around which time bone maturity finally reaches its peak (19).

The number of studies conducted showed a strong general interest in exploring the relationship of physical activity and prevention of osteoporosis, as it is widely accepted that the physical activity increases bone mass, helps to improve balance and coordination, reduces the risk of falls and fractures, increases flexibility and has a positively effect on posture (20). We followed the steps of the other studies and conducted our own study in which physical therapy is combined with Pilates exercises. Physical activity has beneficial effects regardless of the stage of life of a person (21). A research study conducted at the New York University found that if physically active, females in menopause could decrease bone mass reduction by 60% (22, 23). A number of arguments have been documented about the reasons for physical activity to be carried out regularly at least three times per week, adjusted for the age and condition of an individual. Of particular interest are the programs of strength exercise and exercising under resistance (24). However, it is necessary to conduct medical examination before starting with such a program (25).

In conclusion, clinically, the aim was to bring

benefit to patients by helping them to improve their functional capabilities through the prescribed program of exercises, the physiotherapy-Pilates combination, and at the same time to educate them about the importance of physical activity to improve and maintain their current state of the bones. The final evaluation of effect of the physical therapy program has found positive changes in more than 2/3 of the patients in conducting functional activities. It

demonstrates, we believe, the importance of the impact of physical activity and applicability of the approach in our environment, as well as it reinforces the recommendations already given by a number of world experts (26).

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Competing interests: none to declare.

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Tjelesna aktivnost kao važan čimbenik u prevenciji osteoporoze

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SAŽETAK

Cilj Pored edukativnog faktora, studija ukazuje na mogućnosti suzbijanja osteoporoze kroz tjelesnu aktivnost.

Metode U studiju je uključeno 25 pacijentica s osteopenijom. Pacijenticama je preporučeno bavljenje tjelesnom aktivnošću, te su provodile odgovarajuće prilagođene terapijske vježbe u kombinaciji s vježbama pilatesa. Rad smo započeli provođenjem fizioterapijske procjene ispitanica i HAQ upitnika, te na osnovu statusa izradili programe koje su pacijentice provodile tri puta na tjedan, u trajanju od 45 minuta, tokom perioda od 12 mjeseci. Na kraju je načinjena završna procjena i ponovljen HAQ upitnik.

Rezultati Početna fizioterapijska procjena pokazala je kako 68% pacijentica ima velike poteškoće u obavljanju određenih aktivnosti (ustajanja, hoda, kućanskih poslova i osobne higijene), dok preostalih 32% iste aktivnosti obavljaju uz pomoć pomagala ili druge osobe. Od 17 (68%) pacijentica koje su imale velike poteškoće prilikom ustajanja, na kraju je njih 14 (56%) to obavljalo bez ikakvih poteškoća. Pri obavljanju osobne higijene, 24 (96%) ispitanice, početkom istraživanja, izjavile su kako takve aktivnosti obavljaju s mnogo poteškoća, da bi na kraju istraživanja, njih 8 (32%) navedenu aktivnost obavljalo bez ikakvih poteškoća. Kućanske je poslove 18 (72%) pacijentica, na početku istraživanja, obavljalo s mnogo poteškoća, a na kraju je 7 (28%) pacijentica provodilo iste aktivnosti bez ikakvih problema. Na početku istraživanja 18 (72%) pacijentica imalo je teškoće pri hodu, dok je, na kraju tretmana, njih 7 (28%) istu aktivnost provodilo bez ikakvih poteškoća.

Zaključci Tjelesna je aktivnost jedan od važnih faktora u prevenciji osteoporoze, koju treba započeti još u djetinjstvu i provoditi tijekom cijeloga života.

Ključne riječi: tjelesna neaktivnost, osteoporoza, edukacija