بِسّمِ اللهِ الرَّحمَنِ الرَّحِيمِ

«وعَلَّمَكَ مَا لَمْ تَكُنْ تَعْلَمُ وَكَانَ فَضْلُ اللّهِ عَلَيْكَ عَظِيماً »

صدق الله العظيم

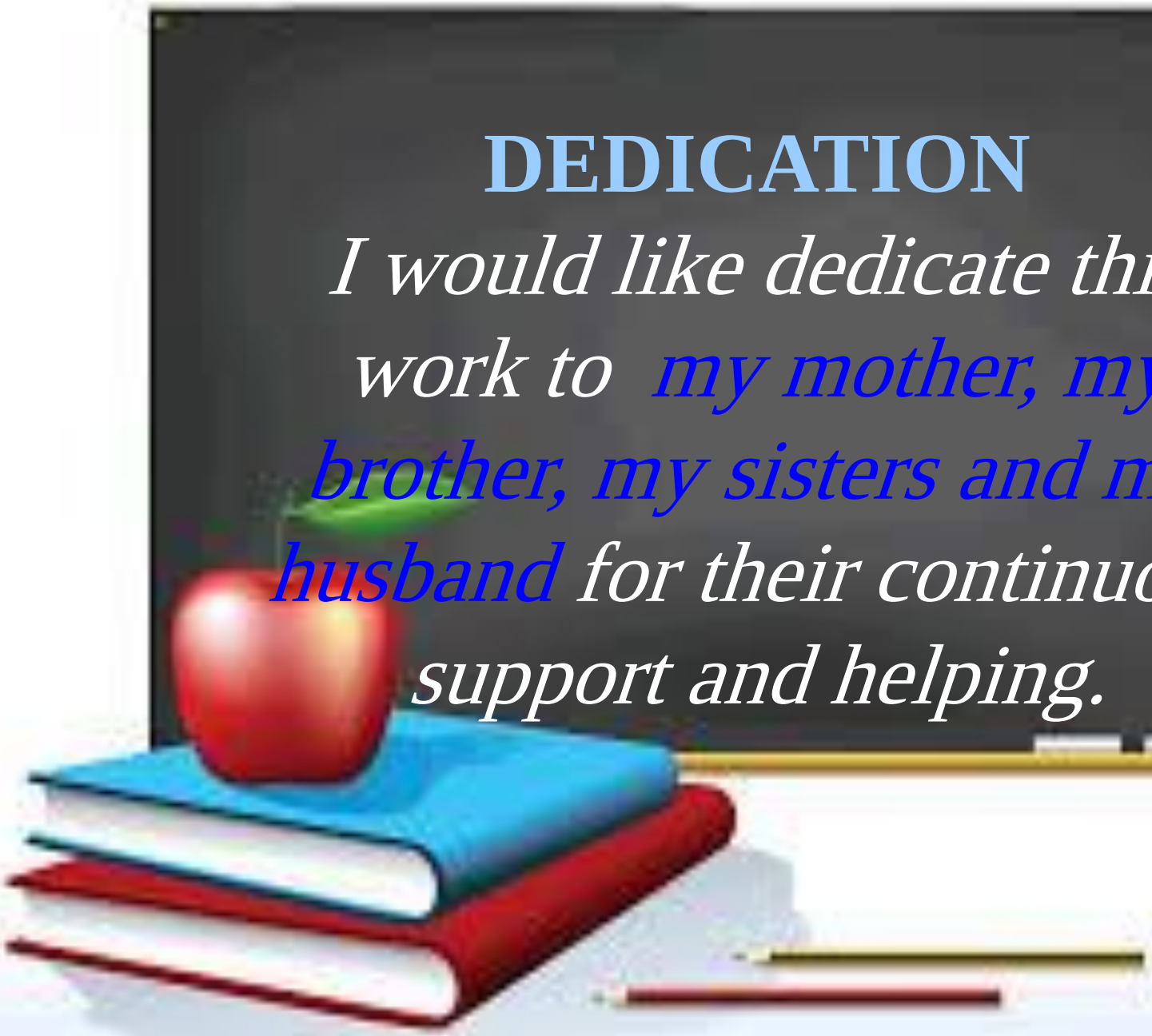
سورة النساء: الأية 113

ASSESSMENT OF BODY BALANCE IN POSTMENOPAUSAL WOMEN WITH AND WITHOUT OSTEOPOROSIS

تقييم اتزان الجسم في فترة ما بعد انقطاع الطمث لدى السيدات اللاتى تعانين أولا تعانين من هشاشة العظام

DEDICATION

I would like dedicate this work to my mother, my brother, my sisters and my husband for their continuous support and helping.




Acknowledgments

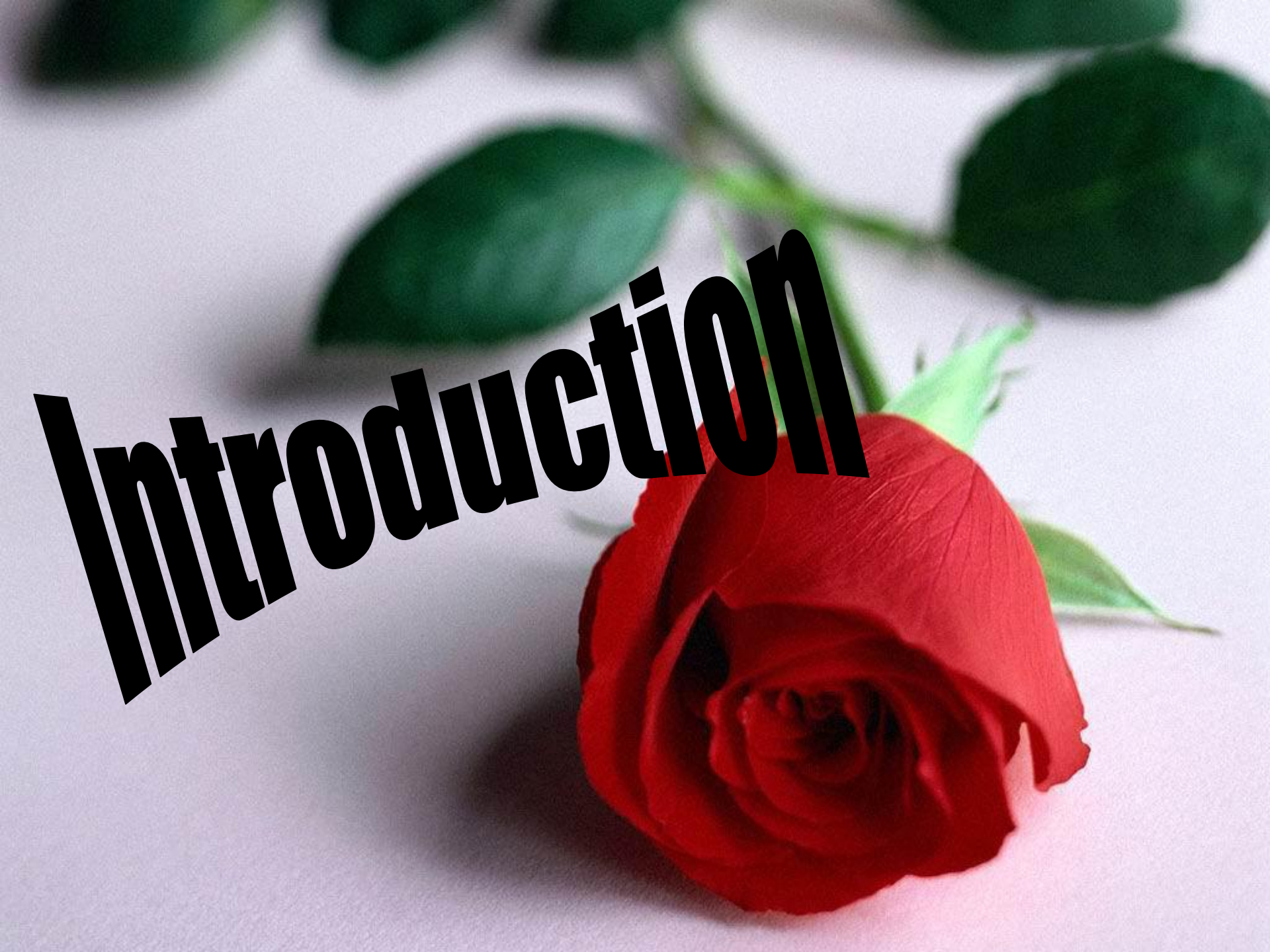
- *Before and above all, thanks to Allah for every thing.*

It is a great honor to me to express my heart felt appreciation and thanks to **Prof. Dr. Amel Mohamed Yousef**, Professor of Physical Therapy for Gynecology and Obstetrics and Vice Dean for Postgraduate Studies and Research, Faculty of Physical Therapy, Cairo University, for her kind supervision, energetic guidance, generous cooperation and continuous encouragement as well as, for offering me much of her time and experience through this work.

My deep thanks and appreciation to **Ass. Prof. Abeer Mohamed Eldeeb**, Assistant Professor of Physical Therapy for Gynecology and Obstetrics, Faculty of Physical Therapy, Cairo University, for encouragement, pushing, guidance, generous support, and extremely valuable assistance through this work.

I wish to express my very special thanks and consideration to Dr. Amir Arabi Gabr, Lecturer of Gynecology and Obstetrics, Faculty of Medicine, Cairo University, for his close guidance, continuous effort. encouragement during this work and his help through the clinical part of this study.


Last but not at least, many thanks to all participants in this study for their co-operation.


Introduction

Osteoporosis is a common disorder characterized by reduced bone mass and deterioration of the micro architecture of the bone tissues, leading to increased bone fragility (Versluis et al., 2001). It affects around 55% of the population over the age of 50 years in the United States (Kuczydski and Ostrowska, 2006).

Osteoporosis constitutes the second largest public health problem in the world, followed only by cardiovascular diseases, according to World Health Organization (WHO, 2000), and constitutes a problem in clinical and social relevance, with serious consequences for health individuals (Pinto-Neto et al., 2002).

A lack of estrogen in postmenopausal women prevents the absorption and utilization of calcium and this is the most important factor in the development of osteoporosis in postmenopausal women (Sachdeva et al., 2005).

It has already been well established that when bones become weaker, muscle status changes, causing modifications to posture and increasing the probability of falls and fracture, since the center of gravity is modified, leading to a loss of body balance (Osteoporosis Australia, 2009).

- Women with osteoporosis have weaker back extensors and hip abductors muscles strength than normal women of comparable age, which may explain difference in mediolateral displacement (Sinaki et al. 2005), .
- Loss of skeletal muscle is one of the major factors, which contributes to frailty and has a profound impact on the quality of life of older people. Loss of muscle strength leads to instability and an increased risk of fall (Young and Skelton, 1994) .

- Individuals with osteoporosis are more likely to present higher sway velocities and greater maximum shift of the center of pressure (COP) due to postural abnormalities such as forward head and kyphosis as the COP is located anteriorly (Burke et al., 2010).

- Women with osteoporosis have reduced flexibility and mobility that affect their walking and contribute towards a greater risk of falling and fracture (Balzini et al., 2003). Persons with osteoporosis reported significantly more fear of falling than healthy controls, which decreases in physical and mental performance and increases risk of falling (Sinaki et al. 2005).

Balance or postural control is defined as the ability to maintain body center of gravity within the base of support during stance or voluntary movements (Daubney and Cuham, 1999).

Biodex Balance System (BBS) is a multi-axial device that objectively measures and records body balance under dynamic stress. It has a movable platform that can be adjusted to provide varying degrees of stability and offers computer-based data. (Hinman, 2000).

- **Aim of the Study:**

  This study was conducted to evaluate body balance in postmenopausal women with and without osteoporosis.


SUBJECTS, MATERIALS AND METHODS

(I) Subject's Criteria:

Sixty postmenopausal women with or without osteoporosis participated in this study. They were selected from the Out Patient Clinic of faculty of Physical Therapy, Cairo University. They were postmenopausal for at least 3 years ago, their ages ranged from 50 to 65 yrs old and their body mass index (BMI) $\leq$ 30 kg /m^2.

(II) Instrumentations:

1. Recording Data Sheet.
2. Weight-Height Scale.

3. Dual-Energy X-ray Absorptiometry (DEXA).

4. Biodex Balance System (BBS):

(III) Assessment Procedures:

1. **Data recording:-**

A full history was taken from each patient before starting this study according to the items of the recording data sheet. Each patient was instructed carefully about the evaluation procedure. A consent form was signed for each patient before participating in the study.

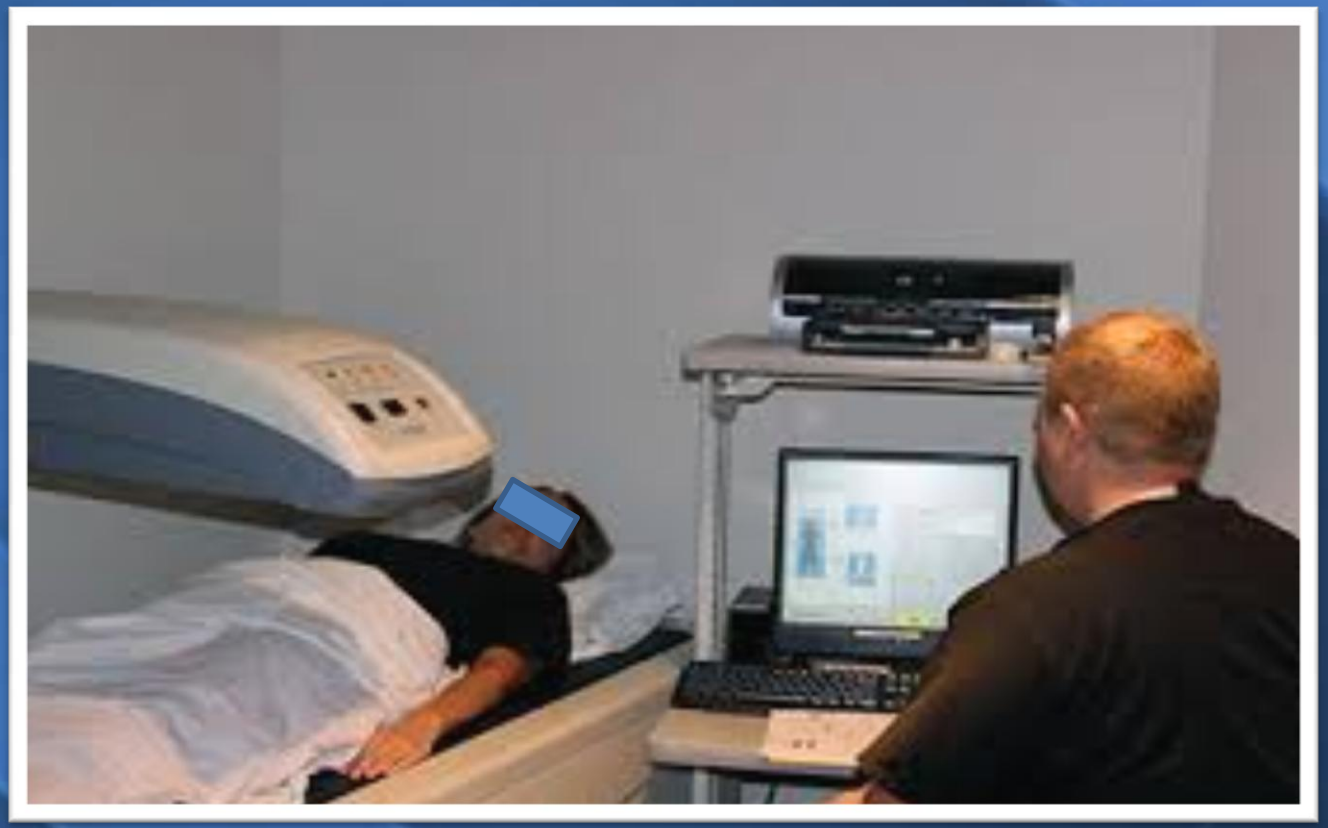
2. Anthropometric measurements:-

The weight and height were measured, and BMI for each woman was calculated before starting the study according to the following equation:-

BMI = Weight (kgs) / Height squared (m^2)

(Must et al., 2007).

3. Bone mineral density measurements:-



4. Dynamic balance assessment procedures:-

The display screen of the BBS showed a report which included the following data:-

- **Overall Stability Index (OSI),** which represents the woman's ability to control her balance in all directions.
- **Anterior/Posterior Stability Index (APSI),** which represents the woman's ability to control her balance in front to back direction.
- **Medial/Lateral Stability Index (MLSI),** which represents the women's ability to control her balance from side to side direction.

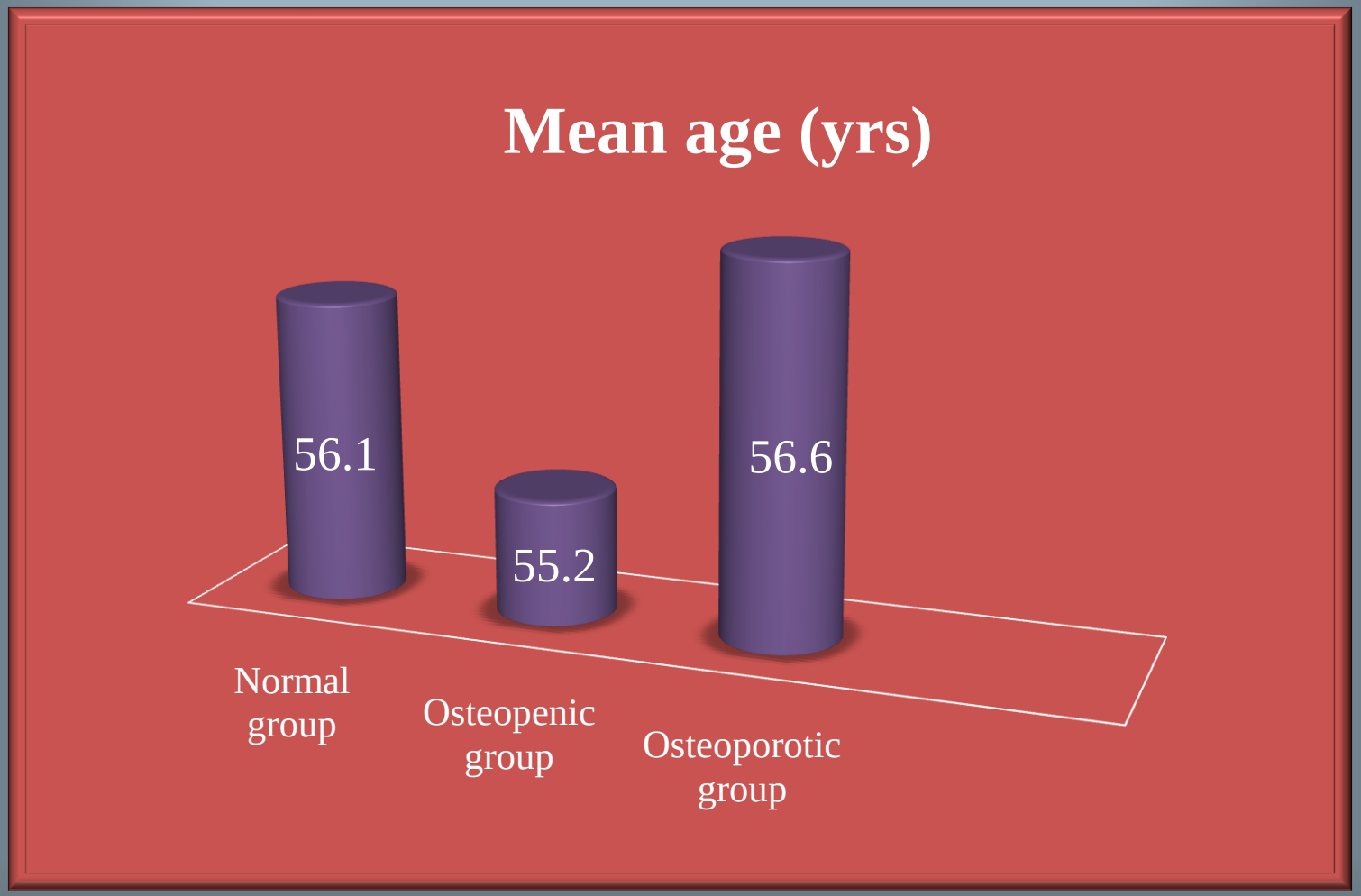

ANALYSIS OF RESULTS

60 cases were assigned into 3 groups:-

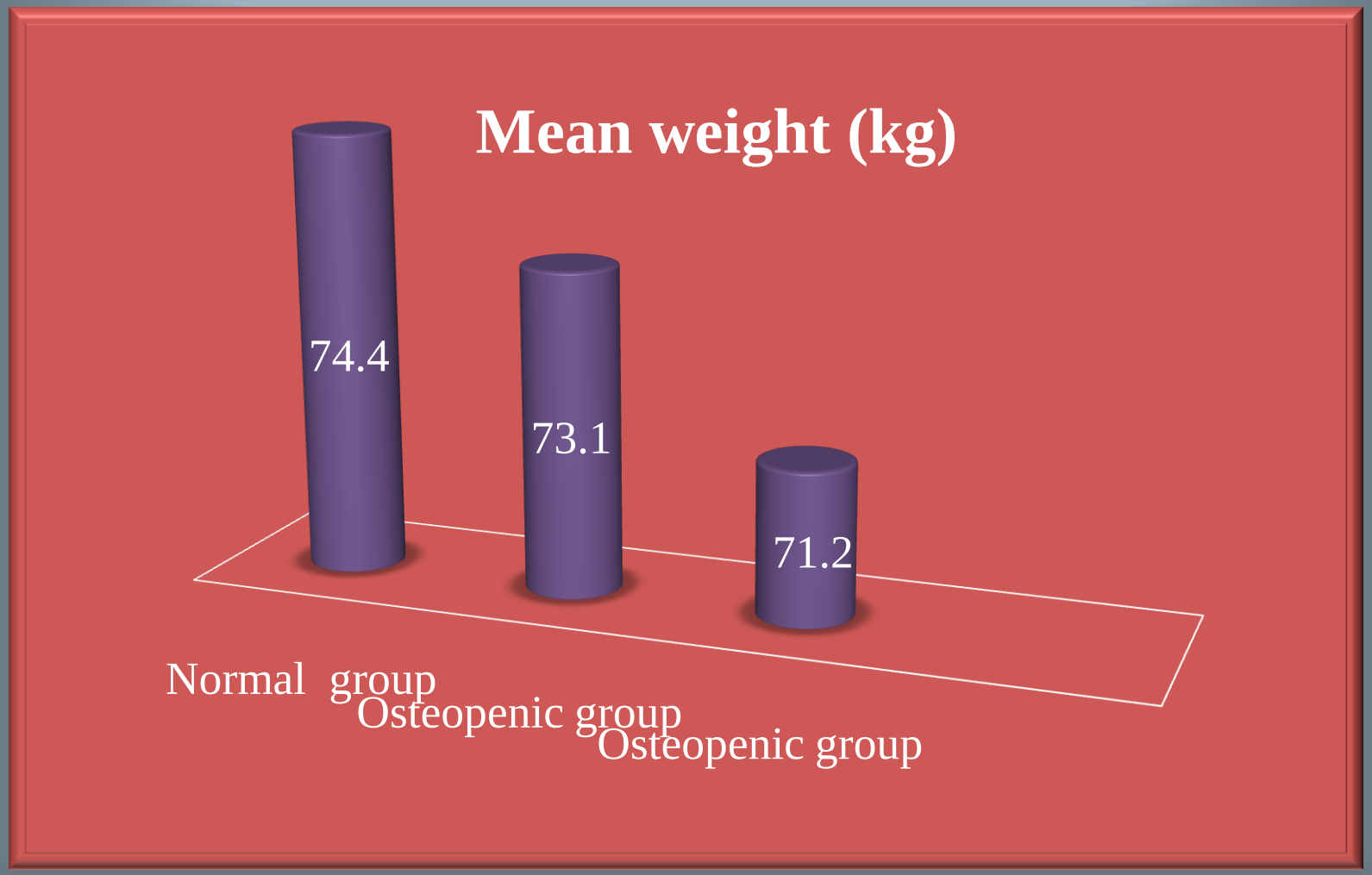
- **Normal BMD group** consisted of 22 postmenopausal women with T- score≥-1SD at L_{2-4}.
- **Osteopenic group** consisted of 22 postmenopausal women with T-score between -1 and -2.5 SD at L_{2-4}.
- **Osteoporotic group** consisted of 16 postmenopausal women with T-score ≤ -2.5 SD at L_{2-4} .

I. Physical characteristics for the three groups:

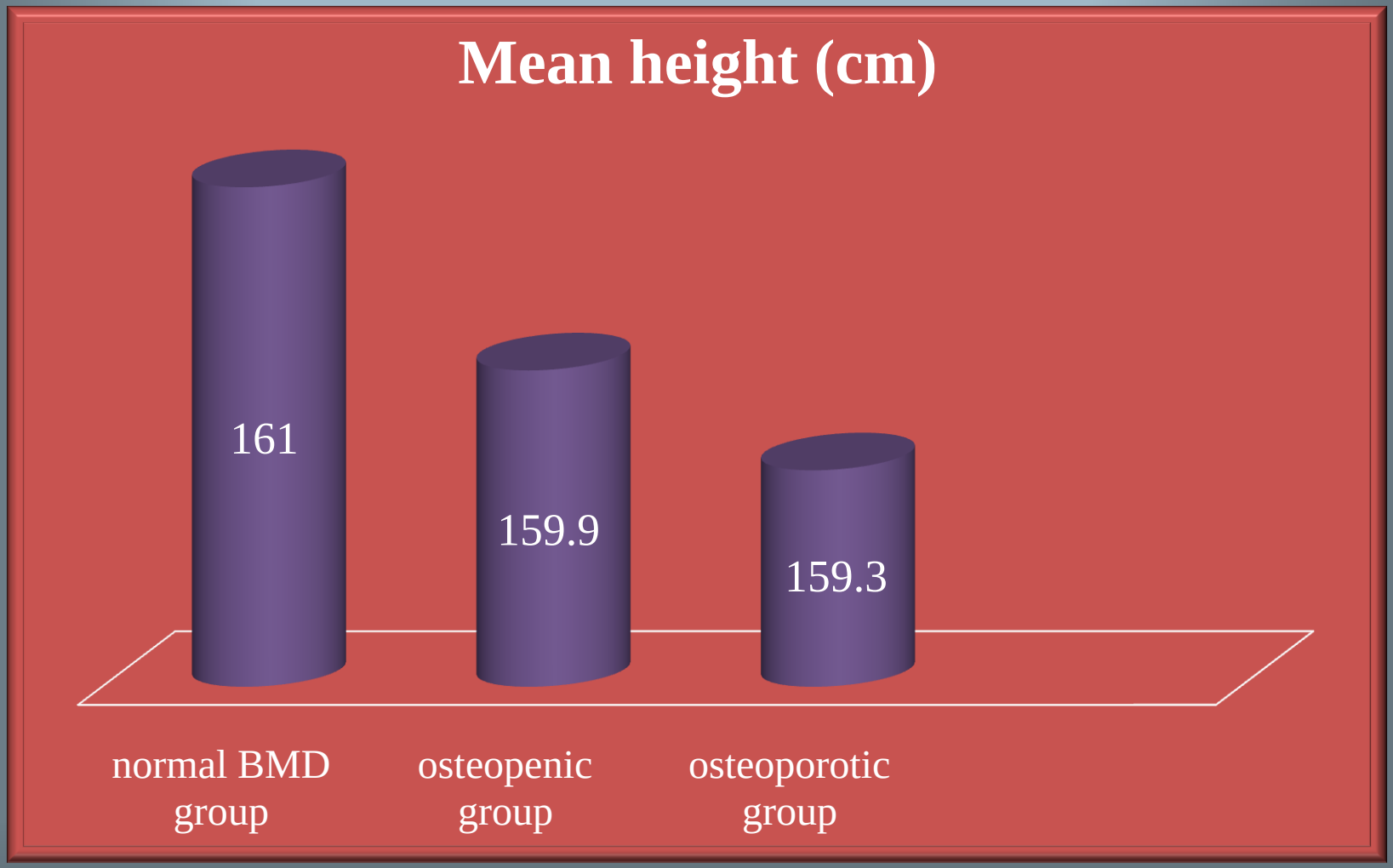
1. Mean values of age in the three studied groups.



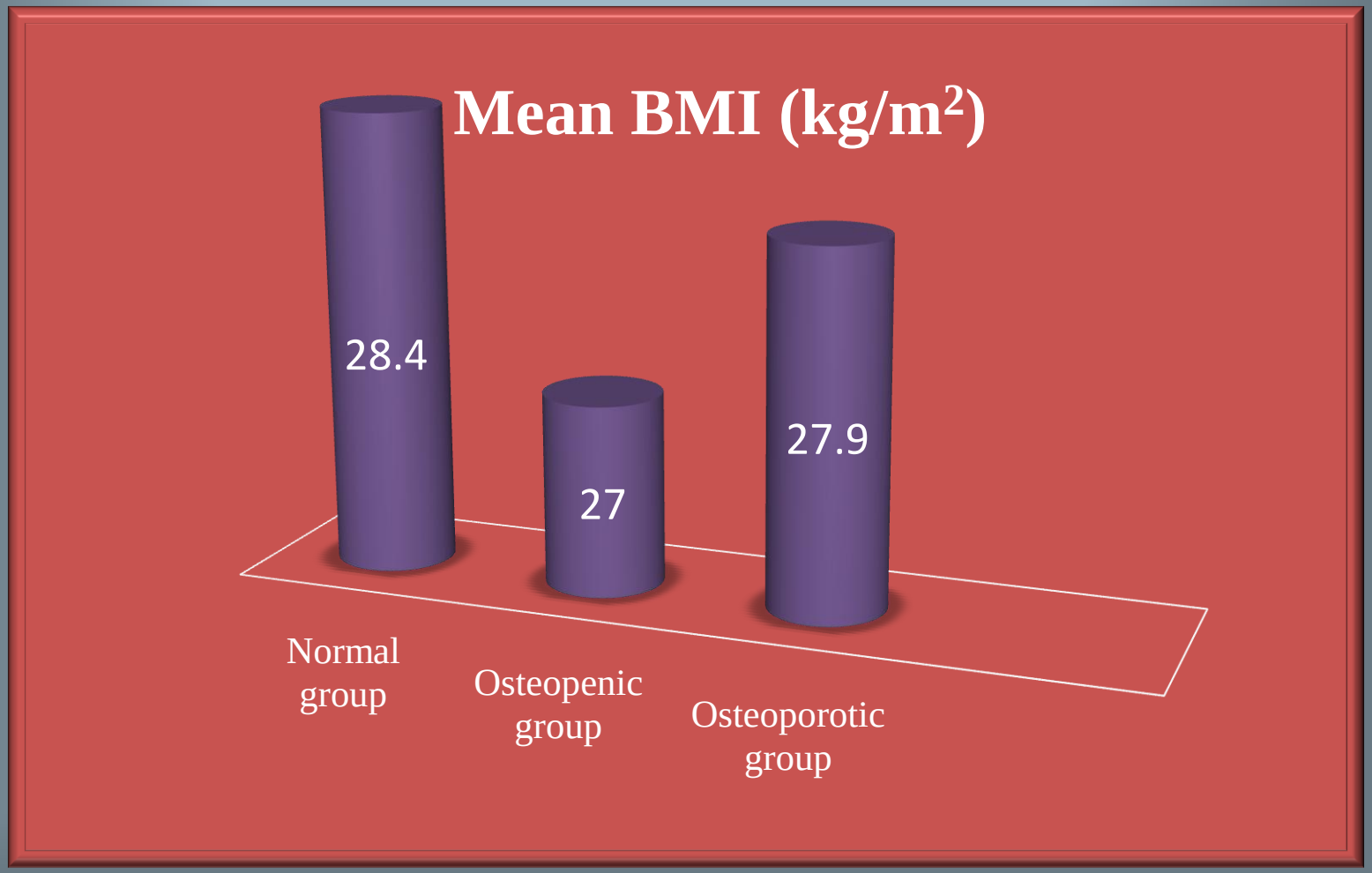
2. Mean values of weight in the three studied groups:



3. Mean values of height in the three studied groups.



4. Mean values of BMI in the three studied groups.



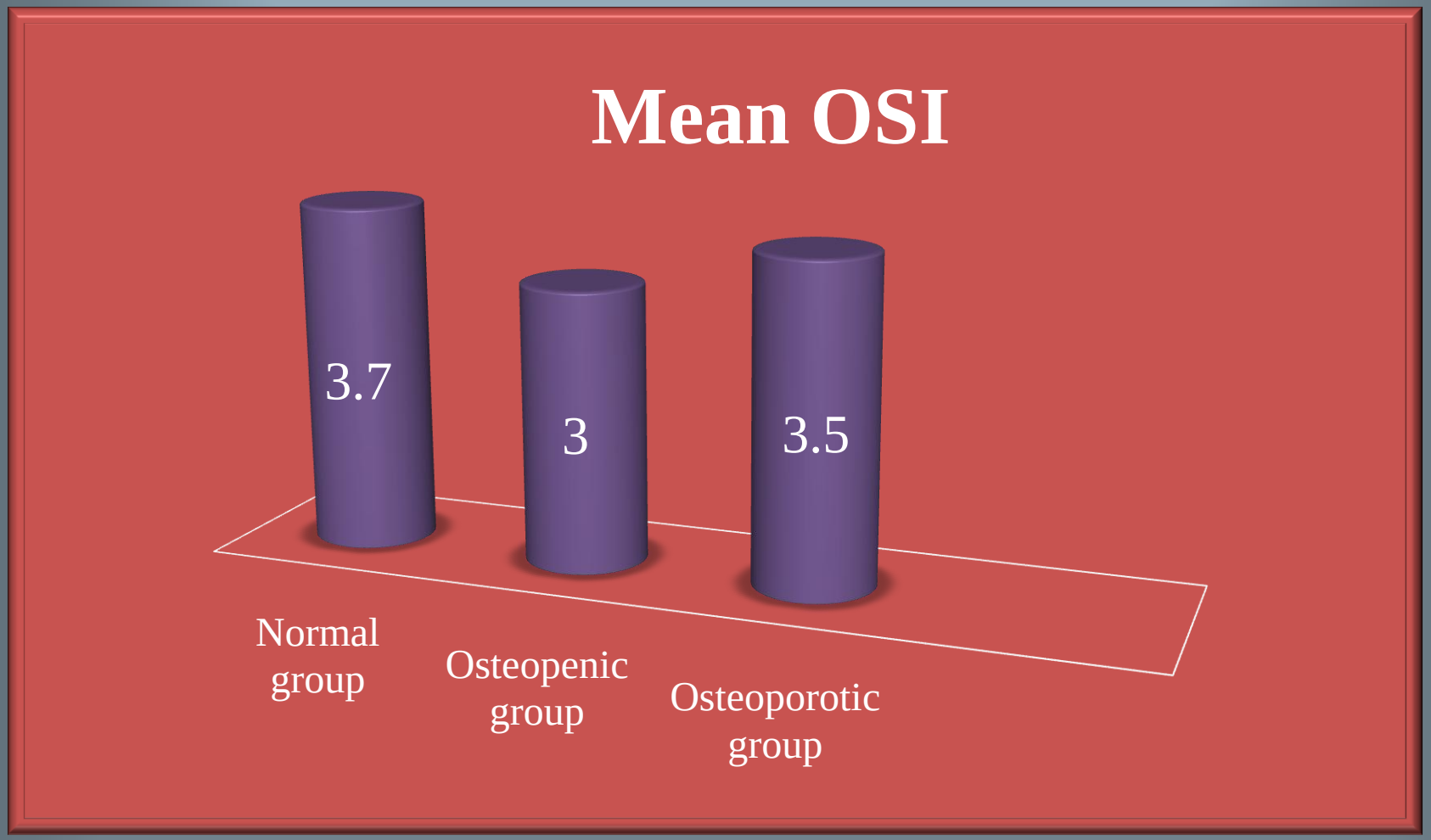
5. Comparisons between the physical characteristics of the three groups:

Dependent Variables	Group I	Group II	P-value
Age (yrs)	Normal BMD	Osteopenic	0.841
		Osteoporotic	0.911
	Osteopenic	Osteoporotic	0.625
Weight (kg)	Normal BMD	Osteopenic	0.772
		Osteoporosis	0.306
	Osteopenic	Osteoporotic	0.672
Height (cm)	Normal BMD	Osteopenic	0.741
		Osteoporotic	0.583
	Osteopenic	Osteoporotic	0.947
BMI (kg /m²)	Normal BMD	Osteopenic	0.958
		Osteoporotic	0.60
	Osteopenic	Osteoporotic	0.762

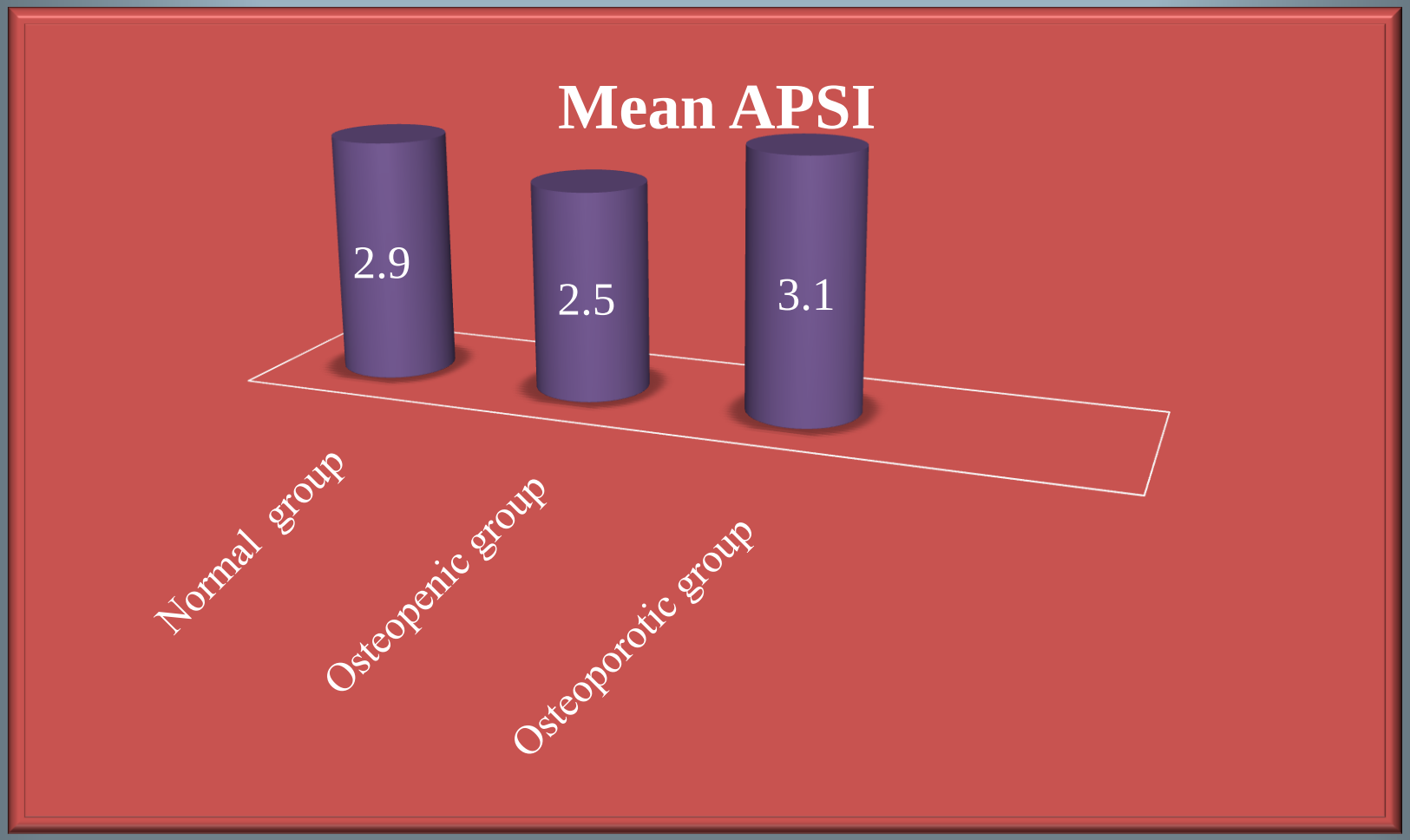
P value > 0.05= not significant.

II- Stability indices (SIs) of dynamic balance test:

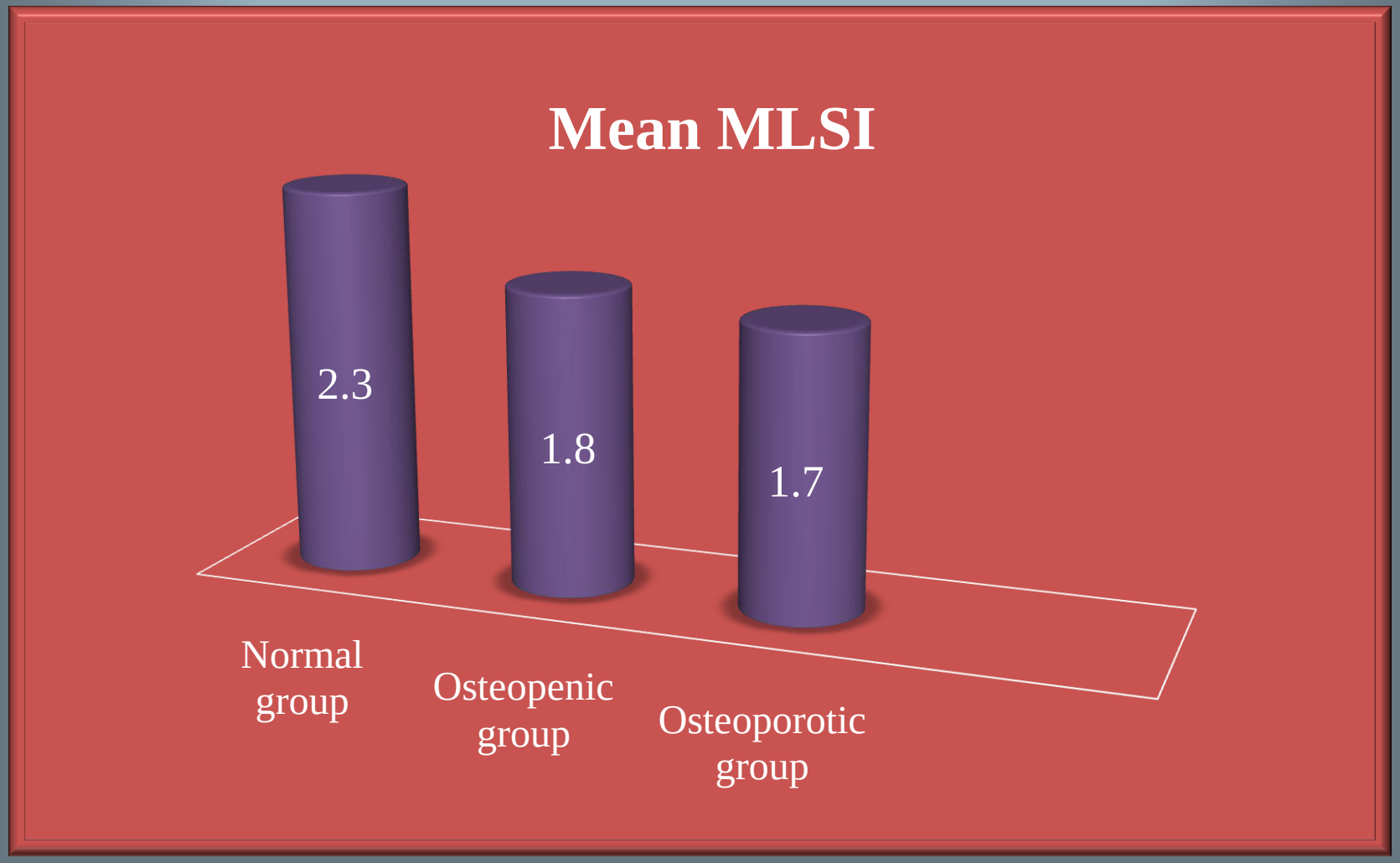
1. Overall Stability Indices (OSI):



2. Anterior/Posterior Stability Indices (APSI):



3. Medial/Lateral Stability Indices(MLSI):



4. Comparison between the stability indices of dynamic balance test of the three groups:

Dependent variable	Group (I)	Group (II)	P- value
OSI	Normal BMD	Osteopenic	0.568
		Osteoporotic	0.992
	Osteopenic	Osteoporotic	0.697
APSI	Normal BMD	Osteopenic	0.703
		Osteoporotic	0.849
	Osteopenic	Osteoporotic	0.411
MLSI	Normal BMD	Osteopenic	0.374
		Osteoporotic	0.363
	Osteopenic	Osteoporotic	0.991

- **P value > 0.05= not significant.**

At the end of this study, it can be concluded that there is no difference in the postural balance between postmenopausal women with normal BMD and those with osteopenia or osteoporosis.


Recommendations

At the end of this study, the obtained results have indicated the need to suggest the following recommendations:

1. Further studies are needed to evaluate the effect of BMD on postural balance with large number of postmenopausal women.
2. Further studies are needed to evaluate the muscular activities during balance assessment in the postmenopausal women.

3. Further studies are needed to evaluate the postural balance in patients with different postural deformities (scoliosis, kyphosis ……etc).

4. Further studies are needed to evaluate the effect of foot wear on measurement of balance.

5. Further studies are needed to evaluate the postural balance in relation to body weight.

Thank You