

2015

## Osteoporosis in older Saudi women: A perspective study

Zahra Saeed Alfaraj  
*University of Northern Iowa*

*Let us know how access to this document benefits you*

Copyright ©2014 Zahra Saeed Alfaraj

Follow this and additional works at: <https://scholarworks.uni.edu/grp>



Part of the [Geriatrics Commons](#)

---

### Recommended Citation

Alfaraj, Zahra Saeed, "Osteoporosis in older Saudi women: A perspective study" (2015). *Graduate Research Papers*. 1250.

<https://scholarworks.uni.edu/grp/1250>

This Open Access Graduate Research Paper is brought to you for free and open access by the Student Work at UNI ScholarWorks. It has been accepted for inclusion in Graduate Research Papers by an authorized administrator of UNI ScholarWorks. For more information, please contact [scholarworks@uni.edu](mailto:scholarworks@uni.edu).

**Offensive Materials Statement:** Materials located in UNI ScholarWorks come from a broad range of sources and time periods. Some of these materials may contain offensive stereotypes, ideas, visuals, or language.

---

## Osteoporosis in older Saudi women: A perspective study

### Abstract

The purpose of this research is to first discuss and discover reasons behind this increasing outburst of osteoporosis cases in older Saudi women and then to develop certain prevention strategies based on Social Cognitive Theory and this research and its reasoning, in an attempt to check the rapid increase of this disease in menopausal Saudi women. All of these targets can be achieved by an in-depth study of osteoporosis, and then applying this knowledge toward prevention of the disease.

OSTEOPOROSIS IN OLDER SAUDI WOMEN:  
A PERSPECTIVE STUDY

Zahra Saeed Alfaraj

20 April, 2014

## TABLE OF CONTENTS

### PAGE

CHAPTER I. INTRODUCTION.....	1
Statement of the Problem.....	2
Research Questions.....	2
Hypotheses.....	2
Significance of the Study.....	2
Delimitations.....	3
Limitations.....	3
Assumptions.....	4
Definition of Terms.....	4
CHAPTER II. REVIEW OF RELATED LITERATURE.....	5
Pathophysiology of Osteoporosis.....	5
Risk Factors.....	8
Risk Factors among Older Saudi Women.....	9
Physical Activity.....	9
Vitamin D.....	11
Parity.....	14
Preventive Osteoporosis and Social Cognitive Theory.....	15
Personal Factor.....	15
Social Factor.....	16
Conclusion.....	17

CHAPTER III. METHODOLOGY .....	18
Method .....	18
Discussion.....	18

## CHAPTER I

### INTRODUCTION

Osteoporosis is a medical term used for a skeletal disorder. Patients with this disorder suffer from decreased and decreasing bone strength and vitality; hence, the patients are at risk for frequent fractures during the rest of their lives; they also are at risk for disability and early death with increased financial burden. Osteoporosis in recent days is recognized as major health issue in postmenopausal women (Riggs & Melton, 1995). Fifty percent of women older than 50 years suffer from osteoporosis or a fracture leading to osteoporosis. In a pilot study of 483 postmenopausal women in age groups of 52 and 62 years, El-Desouki (2013) found the percentage of osteoporosis among the 52-year-olds was 34% and among 62-year-olds it was 24%. El-Desouki (2013) stated that these women are widely affected by osteopenia.

Statistics show that operations in Saudi Arabia related to osteoporosis are going up, and costs are high annually; in 2004, reported cost in USD was 12.78 million per year (Saudi Arabia). According to statistics, in 1999, femoral fractures resulting from osteoporosis cost USD 1.14 billion, and it rose in the next five years by 27% (Saudi Arabia). Osteoporosis is among the most common health problems for Saudi women who are entering the menopausal stage. Almost 44.3% of Saudi women suffer from osteoporosis during the postmenopausal phase (Saudi Arabia).

This health problem is increasing gradually in both number and cost per annum, and this unchecked spreading disease is affecting Saudi women on a large scale (Saudi

Arabia). The problem is why and how osteoporosis is prevalent among older Saudi women ages 50–70.

#### Statement of the Problem

The purpose of this research is to first discuss and discover reasons behind this increasing outburst of osteoporosis cases in older Saudi women and then to develop certain prevention strategies based on Social Cognitive Theory and this research and its reasoning, in an attempt to check the rapid increase of this disease in menopausal Saudi women. All of these targets can be achieved by an in-depth study of osteoporosis, and then applying this knowledge toward prevention of the disease.

#### Research Question

What is the relationship between bone mineral density and vitamin D intake, calcium intake, parity, and level of physical activity in older Saudi women?

#### Hypotheses

It is hypothesized that the prevalence of low bone mineral density among older Saudi women is associated with low physical activity, low calcium intake, parity, and vitamin D deficiency.

#### Significance of the Study

Osteoporosis is targeting more and more women in Saudi Arabia and there is a high risk of this disease getting out of control. It is imperative that the risk factors be identified in order to deal with this issue, hence bringing down the incidence of osteoporosis in postmenopausal Saudi women. This study would help develop strategies to deal with this issue and provide guidelines to avoid the disease. Social Cognitive

Theory, which is theory to change behavior, will be used to help to create strategies to decrease osteoporosis in older women. The goal of Social Cognitive Theory is to increase the knowledge, physical, and psychological environmental support regarding the reasons, the onset, and the avoidance strategies regarding osteoporosis, hence enabling prevention from an early stage, which would ensure that many of these cases do not elevate to a higher level. Keeping existing patients from getting worse and dodging osteoporosis in potential victims is the goal of this study through use of Social Cognitive Theory, by increasing knowledge regarding the disease, increasing environmental support, and increasing preventive and anticipatory measures.

#### Definition of Terms

- Osteoporosis: Osteoporosis is the scientific medical term used for skeletal disorder. Patients with this disorder suffer dramatically decreasing bone strength and vitality; hence, they are at risk for frequent fractures during their rest of life. (Riggs & Melton, 1995).
- Osteopenia: This is neither the normal condition nor severe osteoporosis. The World Health Organization (WHO) defined osteopenia by bone densitometry as a T score  $-1$  to  $-2.5$  and osteoporosis at T score  $-2.5$  or lower (Karaguzel & Holick, 2010).



## CHAPTER II

### REVIEW OF RELATED LITERATURE

As the prevalence of osteoporosis increased among older Saudi women, there became increasing need to determine why this was happening. This research will discover and discuss the relationship between increased incidence of osteoporosis among older Saudi women and level of calcium intake, vitamin D, and level of physical activity. The purposes of this research are: 1) to discover and discuss reasons for this increasing outburst of osteoporosis cases in older Saudi women, and 2) to develop certain prevention strategies based on Social Cognitive Theory and this research and its reasoning in an effort to check the rapid increase of this disease in menopausal Saudi women. These targets can be achieved by in-depth study of osteoporosis and then applying this knowledge toward prevention and cure of the disease. This literature review will provide a background of osteoporosis causes and risk factors. Then, it will discuss in depth the effect of the level of physical activity, calcium intake, parity, and vitamin D on bone mineral density on older Saudi women. After that, it will mention Social Cognitive Theory and use it to create strategies to reduce osteoporosis among older Saudi women.

#### Pathophysiology of osteoporosis

Bone is a connecting tissue between muscles to support and protect all major internal organs of the body as well as a major storehouse for calcium in the human body. It is composed of elastic fibers known as collagen which are made of protein material. Calcium phosphate crystals between the collagen fibers will provide hardness and strength to the framework of elastic fibers. This combination of calcium phosphate

crystals and collagen fibers provides flexibility and hardness to bone, under stress and strain (Ben-Ari, 2007)

It is composed of living cells; some of them control the remodeling of bone, whereas few of them nourish the bone tissue. Like all other living processes, regeneration of bone takes place until the end of an individual's life. In this process of remodeling or regeneration of bone, old cells of bone are replaced by new cells of bone. Age is an important role in determining the speed of the reformation process and it is inversely related with bone remodeling in which bone resorption and bone formation take place (Ben-Ari, 2007). If there is less calcium intake and the body is in need of calcium for other processes, bone calcium is absorbed into the blood. Also, if the formation process does not equal the absorption process of bone, bone mass density lessens, further leading to fractures, deformations, and osteopenia and osteoporosis of bone. Bone resorption and bone formation take place by osteoclasts and osteoblasts, respectively (Ben-Ari, 2007).

During younger ages, bone formation and absorption are speedy, so the new bone is added continuously to the existing bone and the size and strength of bone is comparatively high. Once the individual stops growing vertically, formation of bone continues until age 20; during this stage, individual are observed to have high bone mass density, which may depend on various factors, such as environmental, personal, and social (Ben-Ari, 2007). If there is not proper nutrition and exercise, individual bone mass density may be lesser than those with high nutrition and proper exercise (Ben-Ari, 2007). Genetic factors also play a vital role of up to 50–90% in determining the bone mass and

density. And a remaining influence of 10–50% may be observed from environmental factors (Ben-Ari, 2007).

When an individual reaches age 20, the bone mass and density are observed to be either stable or decrease. This is influenced by living factors such as nutrition and physical exercise. Decrease in bone mass or density starts at the middle age of an individual. In women ages 45–55 who are four to five years into their menopause stage, bone mass is reduced very rapidly (Ben-Ari, 2007).

The leading onset of osteoporosis is observed when there is less growth of bone or lower rate of bone formation; in younger age groups, that results in gaining peak bone mass and bone density in an individual. Attaining peak bone mass during early ages plays an important role in reducing the risk of osteoporosis during the rest of one's life (Ben-Ari, 2007). People who gain the peak of bone mass and bone density during early ages have less risk for osteoporosis even though they face the loss of bone mass during age due to menopausal phase and many other factors (Ben-Ari, 2007).

Bone loss during the menopausal phase in women ages 45–55 years is because of a decrease in estrogen levels. Estrogen is a female sex hormone that plays a vital role in building bone mass and at the same time maintaining bone strength. The decrease in estrogen levels—either by removal of ovaries because of surgery or during the natural menopausal cycle or chemotherapy treatments—will always lead to a decrease in loss of bone mass, leading to osteoporosis (Ben-Ari, 2007). But after completion of the menopausal cycle, loss in bone mass increases rapidly because the amount of estrogen level produced by ovaries also decreases rapidly. A rapid decline of bone mass is usually

seen during the early years of menopause. Loss of bone mass resulting in osteoporosis may be caused by different factors such as improper diet, lack of immunity, regular health disorders, medications, and long-term hospital treatments. Also, drinking excess alcohol and caffeine-related products decreases the absorption of calcium from blood, which leads to osteoporosis (Ben-Ari, 2007).

### Risk Factors

A wide range of risk factors is associated with osteoporosis; some are modifiable and others are not. The age factor, femininity, comes under non-modifiable risk factors and is the leading risk factor for those suffering from osteoporosis. In addition, it has been observed recently that most women face a premature menopausal phase that is causing rapid loss of bone mass and bone density because their estrogen levels decline just as rapidly (Pena & Perez, 2014). Osteoporosis is an inherited disease with chances of 20–80% that it is associated with 30 genes. Bone fractures also are associated with the double chances for osteoporosis. Even bones with small cracks increase risk of developing osteoporosis (Pena & Perez, 2014).

Lack of nutrition, improper diet, lack of exercise or physical activity, alcoholism, intake of huge amounts of caffeine drinks, lesser intake of proteins, deficient for production of vitamin D, less exposure to sunlight, and exposure to chemical radiations and heavy metal pollutions are categorized under modifiable risk factors (Pena & Perez, 2014). Alcohol consumed in limited dosage helps to increase the bone mineral density, but more than three drinks per day causes risk for osteoporosis. Because of an increase in parathyroid hormone levels, there is a great deficiency in vitamin D levels, which leads to

a higher risk for lower bone mineral density. Smoking is high in caffeine content, which reduces the calcium absorption thereby reducing the bone mineral density and causing risk for osteoporosis (Pena & Perez, 2014). Women who smoke will have the risk of facing a premature menopausal phase, increasing the risk for osteoporosis at early ages of life. Improper diet, or lack of nutrition or malnutrition limits the calcium absorption, and limits micronutrients such as phosphorous, zinc, iron, magnesium, and vitamin K, thereby implicating the bone formation. Severity of exercise will suppress the sex hormones, thereby leading to a higher risk for osteoporosis. Physical inactivity also causes a higher risk for osteoporosis and heavy metal pollution will increase the risk for osteoporosis by decreasing the bone mineral density. Soft drinks are high in phosphoric acid content that lowers the calcium to phosphorous ratio, so it is better to remove these drinks from one's diet (Pena & Perez, 2014).

#### Risk Factors among Older Saudi Women

Many factors affect bone mineral density among older Saudi women, including level of physical activity, vitamin D level, parity, and level of calcium intake.

#### Physical Activity

Lack of physical activity plays an important role in the onset of osteoporosis. Numerous research studies related to osteoporosis showed that women with little or no physical activity are at great risk for osteoporosis, in comparison with physically fit and active women (Al-Nozha et al., 2007). In a research study, Al-Nozha et al. (2007) aimed to gauge the levels of physical activities in Saudi women ages 30–70. The results showed that 96.1% of men and women in Saudi were found physically less active to inactive in

their everyday routine life. This inactivity ratio was found quite a bit higher in Saudi women, with 98.1% compared to Saudi men with 93.9%. Moreover, the study states that there is an increased risk for osteoporosis as age increases, because of inactivity levels. So, physical inactivity is one of the most important causes for osteoporosis (Al-Nozha et al., 2007).

The most important point to be noticed from this research study is the direct relation between education and physical activity. That means when a person is highly educated, his/ her physical activity routine is high. Physical inactivity results not only in osteoporosis but also in several other risk factors such as heart disease and obesity (Al-Nozha et al., 2007).

Physical inactivity generally causes a major threat to the overall health of Saudi people (both men and women). Furthermore, a leading cause of physical inactivity is a lack of education, which is preventing Saudi people from understanding the importance of a healthful lifestyle (Al-Nozha et al., 2007), including physical activity and care for health which helps to reduce the risk of BMD (Al Quaiz et al., 2014).

Bones are highly exposed to risk of damage and injury as the individual grows older. Bones become weak and susceptible to an increased risk for osteoporosis. According to convincing studies, exercises specifically done in a regular manner will prevent bone damage and make them strong (Warburton, Nicol & Bredin, 2006). Weight bearing exercises or work also will help to build up strong bones and keep them strong even in old age (Warburton, Nicol, & Bredin, 2006). In an RCTS meta-analysis, training exercise programs were found to reduce or reverse the bone loss by 1% bone loss per

year in femoral neck and lumbar spine during pre- and postmenopausal stages of women. There are increased chances of bone fractures when elderly people age and may collapse or fall accidentally. Because old age is marked by a gradual loss of mineral bone density, leading to osteoporosis, a fall or collapse at this age might be very dangerous. By following a physical exercise routine, elderly people, especially women, can maintain the mineral density to prevent those bone fractures of damaged or osteoporosis bones. It is true that physical exercise can burden old people (Warburton, Nicol & Bredin, 2006). According to the research study conducted with women just entered into their menopausal stage, a two-year intensive exercise program resulted in gradual decrease in loss of bone density. Therefore it is clear that physical activity or physical exercise is the best method to avoid or decrease the chance of osteoporosis and will also initiate a healthy living behavior, thereby reducing or avoiding the chances for major diseases (Warburton, Nicol, & Bredin, 2006).

### Vitamin D

The relationship between the intake of calcium, bone mass density, and vitamin D play a vital role in maintaining and promoting bone mass and mineral density of bone, thereby reducing or preventing the damage of bone or fractures in individuals suffering from osteoporosis. Various health organizations and researchers say repeatedly that a minimum daily intake of calcium will help women, but many women fail to take even this minimum value, especially in the Middle East and Arabian Peninsula (Alisa, Qadi, Alhujaili, Alshehri, & Ferns, 2011) . Various studies stated that lack of calcium in food is affecting adults in these countries. This will lead to a decrease in bone mass density

and to osteoporosis and fractures (Alisa, Qadi, Alhujaili, Alshehri, & Ferns, 2011). Intake of food with a lower calcium level on a regular basis will lead to deficiency of vitamin D in body. As an individual's age increases, vitamin D levels are observed to decrease and cannot be brought to normal levels even as vitamin supplements or calcium supplements (Raef et al., 2011). Variation in skin epidermis can hide the ability to convert sunlight exposure to vitamin D. Renal functioning also is altered in this case; as a result, 1, 25 dihydroxy vitamin D is not converted to Vitamin D, which is an active binding precursor. Vitamin D levels are observed to be low in osteoporotic women, and it is recognized that lower levels in vitamin D are the leading cause for osteoporosis in women. For decades, it has been stated that insufficient and deficient vitamin D levels are causing adverse effects in skeletal system of the human body as well as in other parts of body.  $<50$  nmol/L is the deficient dosage of vitamin D; hence, we need to maintain a daily dosage of  $> 70$  nmol/L. (Raef et al., 2011).

In the Middle East, a majority of people are reported to have low levels of Vitamin D and several studies have shown a vitamin D deficiency in most countries in the region (Raef et al., 2011). In one research study from Lebanon, approximately 18% of population had vitamin D deficiency (defined by a 25(OH) D value below 15 ng/mL or 37 nmol/L), with women observed at greater risk than men (83.9% vs. 48.5%) (Raef et al., 2011). It is difficult for Saudi people to be exposed to sunlight for a long time because temperatures are very high, with a high intensity of sunlight. Most people stay indoors, and even when outside, they stay in the shade. Even by consuming dairy products, they were not able to increase the levels of vitamin D in Saudi Arabia, so it is not surprising



that there are more reported cases of osteoporosis and bone fractures and less bone mass density in women older than 50 years and those in a menopausal phase. Almost all (98%) of elder Saudi women in the menopausal phase had Vitamin D in deficient dosage of <50 nmol/l, while other mineral deposits are in regular levels (Alisa, Qadi, Alhujaili, Alshehri, & Ferns, 2011).

Postmenopausal women with high socioeconomic status and normal bone mass density reflected a better living style (43% of control group lived in villas versus 23% of the osteopenia women group) and highly educated women (44% of control group were university graduates versus 23% of the osteopenia group) were observed to be more likely to have a healthful living style (Alisa, Qadi, Alhujaili, Alshehri, & Ferns, 2011).

Another thing that may influence the levels of vitamin D production is clothing style (Allali, Aichaoui, Saoud, Marroufi, Abouqal, & Hassouni, 2006). One study revealed that wearing a veil resulted in lower levels of vitamin D (Raef et al., 2011). But this religious and cultural practice for Saudi women to wear veils is unlikely to be a major cause for deficiency of vitamin D. Certain schools in the Arab world found that wearing a hijab is a major cause for lower levels of vitamin D in Arab women but there is no scientific support for this statement (Alisa, Qadi, Alhujaili, Alshehri, & Ferns, 2011).

Adults in the northern part of the U.S and European countries reported greater hypovitaminosis D than adults living near the equator. But there also were high levels of vitamin D in the summer and lower levels in winter. Because sunlight plays a vital in vitamin D synthesis, it is quite logical to show much less or no deficiency of vitamin D in tropical countries. However, research conducted in a few Asian countries such as Turkey,

India, Iran, and Saudi Arabia in the last several decades showed a high prevalence for vitamin D deficiency (Allali, Aichaoui, Saoud, Marroufi, Abouqal, & Hassouni, 2006).

Saudi Arabia is the largest sun-exposed country. According to studies, 68% of the population under observation avoided sunlight exposure, causing a deficiency of vitamin D in Saudi Arabia (Alisa, Qadi, Alhujaili, Alshehri, & Ferns, 2011).

### Parity

During pregnancy, intestinal absorption of calcium increases to meet the requirements of the fetus, whereas maternal bone density loss is seen in the last stages of pregnancy. Bone density is lost during breast feeding; however, this loss is restored in weaning, as menses and ovulation restarts (Bayray & Enquesslassie, 2013). Loss of bone density and restoration is a naturally occurring process and is independent of lifestyle habits like intake of dietary calcium, physical exercise, etc. Epidemiologic studies indicated that neither multiple pregnancies nor prolonged lactation are associated with osteoporosis when measured by bone mass density or by assessing the risk of fractures (Bayray & Enquesslassie, 2013).

In contrast, a few studies reported that risk for hip bone fracture in women is decreased by 5–10 % on having each additional child (Bayray & Enquesslassie, 2013). In a parallel association, a few more researchers believe that pregnancy and lactation in women who are healthy do not cause them risk for bone density loss. In a recent study, women with 10 pregnancies and prolonged lactation had the same bone mass density as women with no pregnancies yet (Bayray & Enquesslassie, 2013). Having many children will not increase the risk for osteoporosis or fracture. Of 19 research studies, six have

shown a positive effect of parity of bone mass density in women in a postmenopausal phase. Eight other research studies supported the negative parity of bone mass density in women in a postmenopausal phase. The other five studies have not shown any effect on parity of bone mass density (Bayray & Enquesslassie, 2013).

### Preventive Osteoporosis and Social Cognitive Theory

Social Cognitive Theory states that cognitive and other factors such as environment, behavior, and personal attitudes operate reciprocally to each other. Therefore, factors influencing the prevention of osteoporosis are engaged with personal as well as social factors. Personal factors include age, education, knowledge, and self-efficacy, whereas social factors include social capital and support (Hsieh, Wang, McCubbin, Zhang, & Inouye, 2007).

### Personal Factor

Age is suggested as the most important personal factor affecting the process behavior of health. Elderly women are more frustrated to follow the knowledge and practices to prevent osteoporosis than young women (Hsieh, Wang, McCubbin, Zhang, & Inouye, 2007). Age is reciprocally related to knowledge of osteoporosis as well as social support. Age also influences self-care behavior. This theory was supported by our results; age has a reciprocal relationship with intake of calcium which indicates that the older the people, the lower the intake of calcium, and the higher the risk of osteoporosis. Therefore, in nursing homes, increased osteoporosis prevention behavior is considered an essential personal element (Hsieh, Wang, McCubbin, Zhang, & Inouye, 2007). The

higher the educational level, the more the positive initiatives to prevent osteoporosis, as well as social support.

### Social Factor

Social support involves personal interactions to provide psychological assistance to help solve the issue, with the assistance provided mainly from interpersonal connections rather than someone new. This study resulted in positive association of social assistance with self-efficacy (Hsieh, Wang, McCubbin, Zhang, & Inouye, 2007).

Statistical, significant, predicted knowledge of intake of calcium and knowledge of weight bearing exercises is provided by social support (Hsieh, Wang, Mcubbin, Zhang, & Inouye, 2007).

Physical activity may be influenced by interpersonal relations by providing the social assistance and thereby establishing the norms that promote health—for example, by engaging in physical exercise in a group and creating an environment for positive social norm for physical exercise among the social group. Daily physical exercise and activity also will encourage the individual to learn and enjoy the benefits of physical activity (Stahl et al., 2001). When an individual is in a social group, there is a sense of attachment among the individuals that will initiate access to informative resources, goods, and materials that support physical activity. Membership or identity in a social network among the individuals or organizations provides the coping resources to promote participation in physical activity, like helping to initiate a physical exercise program or lobbying for improvements of existing physical exercise facilities, such as municipal parks and sidewalks (McNeill, Kreuter, & Subramanian, 2006).

There is no perfect definition for social environment but social scientists agree that it is a place where individuals are influenced to live by shaping norms, forced to follow strict patterns of social control, provide an opportunity to engage in a particular behavior, which can both reduce and produce stress through individual choice. Major health behavioral outcomes are socio-patterned or distributed, and have negative impact only on those who live in a social group and physical environments that have a deficiency of resources (McNeill, Kreuter, & Subramanian, 2006). Individuals living in this physical and social environment have a high risk of engaging in unhealthful attitudes, including physical inactivity, often considered as hazardous and stressful environments. Many psychosocial emotional factors were recognized to be helpful to explain why some people are active and others are inactive. In addition to these selected personal factors, social, physical and political environments of the individual play leading roles in healthful behavioral outcomes (McNeill, Kreuter, & Subramanian, 2006).

This is an agreement on an effective public health approach to promote physical activity to address the modifiable social, physical environmental factors supporting behavioral change and thereby increasing the efforts to understand the influence of factors on physical activity. This behavior is shaped inherently by individuals whose social environment occurs within family bonds, communities, and neighborhoods. Advising an individual to participate in physical activities, without any consideration of social norms, activity opportunities, and resources to help them be physically fit will not produce any behavioral change. However, premises from social ecological, social contextual theories, and a contextual model will simultaneously shape behavior along

with environmental and individual factors (McNeill, Kreuter, & Subramanian, 2006). In addition to facilitating the initiation of physical activity, understanding of environmental, social, political, and cultural influences has profound importance. It is well known and accepted in general that different cultures exhibit different health outcomes promoted by different beliefs. The socioeconomic, sociocultural, and environmental context of conservative social norms and Gulf countries stated that the traditional roles of women keep them from being physically active. Women in Gulf countries face such barriers as limited opportunities to attend health clubs and get sunlight, plus high usage of automobiles and consideration for usage of domestic employment services (Mabry, Reeves, Eakin, & Owen, 2009).

#### CONCLUSION

With the prevalence of osteoporosis increasing among older Saudi women, it has become increasingly necessary to determine the reason. The relationship between increased incidence of osteoporosis among older Saudi women and level of calcium intake, vitamin D, parity and level of physical activity are clearly related to this increase. Reversing low vitamin D and calcium, lack of physical activity, and parity can play major roles to decrease osteoporosis. Using this information, Social Cognitive Theory will help to develop strategies to prevent this disease among older Saudi women.

## CHAPTER III

### METHODOLOGY

Databases searched included Google, Google Scholar, UNI databases A-Z, and UNI one search. Search terms included osteoporosis, osteoporosis risk factor, osteoporosis in older Saudi women, Vitamin D deficiency, calcium deficiency in Saudi women, parity, physical activity and Saudi females, preventing osteoporosis, preventing osteoporosis program, social cognitive theory, preventing osteoporosis and social cognitive theory, social ecological model and osteoporosis, and preventing osteoporosis based on social ecological model.

#### **Discussion**

Lack of physical activity, vitamin D and calcium deficiency, and parity factors depend on changing behavior. To overcome or reduce the factors that cause osteoporosis in Saudi Arabia, we need to change behavior. The Arabic world cares too much about society while the Western world cares just about individuals, so changing behavior in Saudi society will be easier if people work as group and gradually change their cognitive and social norms and culture. Just as a social environment is necessary to change Saudi female behavior, there also must be a physical environment where groups are engaged in making changes. Groups such as family, peers, neighborhood, community, schools, and universities all are important to change cognitive attitudes and then social norms and behavior will change automatically.

Saudi society needs this change to improve health outcomes and reduce not just osteoporosis disease but address others health issues. This reduction will have a huge

impact on the country's burden. Because family has a great effect on individual behavior, involving older women in our program is important to shape their family members' behavior, in addition to working on students' schools and universities to achieve long-term goals for future generations. In osteoporosis prevention programs, planning to change behavior needs long-term goals, not just temporary short ones. So, the target population will not be just older Saudi women but also school and university students of all ages, girls who going to get married, and women after pregnancy and in lactation time. Target behaviors are physical activity, consuming healthful food rich in calcium and vitamin D, and exposure to sunlight as much as possible. One barrier that restricts Saudi females from physical activity or eating healthful foods is not having female role models among peers and families.

This research paper concentrates on older women, not just to improve their health but also because they are important role models for their daughters and granddaughters to achieve long-term goals. Respect and caring for parents is important as they age. Muslim culture needs to show more respectful and caring ways with them. They are mentioned in the holy Quran: And God say, "My Lord! bestow on them Thy Mercy, even as they cherished me in childhood" (Quran 17: 23–24), (And that you be dutiful to your parents. If one of them or both of them attain old age in your life, say not to them a word of disrespect, nor shout at them but address them in terms of honor" (Quran 17:23). So we should incorporate mothers in our programs and give them an opportunity to participate in appropriate exercises to keep their bones healthy. Because older women are rarely engaged in physical activity, it will be embarrassing for them to participate in centers or



events with fashionable names (young age name) so choose names related to health to attract them. Also, at this age, women have more fears about their health and future dependency on others, so their fears will attract them to participate in our programs. When they understand osteoporosis risk factors and skills, they will be able to apply them in their families to help others avoid this disease.

Social cognitive theory helps comprehension of the various components and practices that result in lack of physical activity and consuming unhealthful foods, but it does not consider other powerful factors that enable females to engage in physical activity and consume healthful foods, for example physical environment and public policy. The Social Ecological Model contains these factors and also helps to organize thoughts and create interventions in understandable and effective ways (Victorian Curriculum and Assessment Authority (VCE), 2010).

Behavior is not easy to change, especially in an environment that does not support that change. Saudi Arabia lacks environments that help people to be active, healthy, and educated about health. Thus, working on different environmental levels at the same time will be more likely to change Saudi female behavior. The Social Ecological Model is more suitable for Saudi society because it considers the multiple levels of environment (VCE, 2010).

Based on the Social Ecological Model, interventions will be created to apply in the eastern region in Saudi Arabia, Qatif (Al-Qatif city, Al-Qala'a, Tarout Island, Umm-Sahik, Saihat city, Safwa city, Sanabes, Al-Rabi'ia, Al-Awamiyah, Al-Jish, Al-Qudaih, Al-Jaroudiya, Umm Al-Hamam, Al-Taubi, Al-Khuwailidiya, Hellat-Muhaish, Enak, Al-

Awjam, Al-Malahha, and Al-Rabeeya). If these interventions are successful, they will be applied in other parts in Saudi Arabia, with whatever changes may be necessary to be suitable for their culture.

### **Individual**

The nuclear level of the Social Ecological Model is a personal level that includes knowledge, attitudes, and skills. Improving these components of personal factors will improve the likelihood of changing behavior (VCE, 2010).

Education to increase knowledge about osteoporosis risk factors and how to avoid them is intended to achieve short- and long-term goals for all female ages. There will be specific techniques for older women based on their high motivation, diverse life experiences, and mature interpersonal skills. Rather than regular lecture style classes, group discussion with individuals sharing their stories and experiences will be more effective for their understanding (Anderson, 1999). For people with little education, it is appropriate to use other strategies to improve their comprehension of health information: limit amount of information provided each time, "slow down," avoid medical jargon, seek out education materials at appropriate reading levels, use pictures or models to explain important concepts, confirm understanding with "show-me" or "teach-back" methods, encourage women to ask questions, and actively engage respected peers or daughters as part of the learning process (Kountz, 2009).

To increase awareness about osteoporosis, we will make a screening test related to osteoporosis that provides information in a simple way. Surveys are important at first to know the barriers, desires, and rewards that motivate them. We will seek out our target

population in religious places and events, schools, universities, malls, and primary care health centers. Posters will be used in critical places to show the importance of being healthy and active. Participation in programs will be mentioned by scholars in religious events, and by using media and social media. Seminars and presentations with visual explanation will be used to make it easier to understand, including free dietician counseling in supermarkets and a healthy body curriculum in schools and universities. There also will be workshops by specialists (exercise therapist, physical therapist, dieticians) who have very good communication skills to detail the skills necessary to take care of their bones and provide them with handouts.

For patients who have regular appointments in primary health care, doctors should mention osteoporosis and how to avoid it and give patients exercise prescriptions. Videos should be used to educate them. Phone messages should be sent to remind them, for example on Mother's Day send a message to remind daughters about helping mothers have strong bones—"if you love your mother, help her to be strong."

Females of all ages should be shown examples from real life about older women caring about nutrition and physical activity and how they are strong until now and vice versa and use them to increase their beliefs, motivate them. Social Marketing is important to increase people's beliefs. For example, use fear in advertisements to stimulate older women to consume a more healthful diet and be more active. Use attractiveness in advertisements to stimulate children and adolescent for example, give children a book with simple visual information where they can collect stamps from milk or any health

products. For adults, the use of fears and attractiveness will be more helpful to engage them to consume healthful food and be active.

Men can help to enable and encourage Saudi women to change their behavior and participate in activities in bone health centers by providing them time and sharing family tasks. Media should concentrate on men to show how important it is for women to have a healthy lifestyle and to be active and consume healthful food—and that they can help by encouraging women to be physically active. This could be done, for example, before Valentine's Day, with messages on social media

### **Self-efficacy**

A supportive environment is needed for participants and so that they can fulfill the programs and their own objectives. The program will be intended to assure early accomplishment for every woman from the first session so they can build up a positive attitude; for instance, they could lift heavy weights and have regular attendance. Feedback is so important to improve women's confidence and positive reinforcement and rewards are important to achieving goals (Shuval, Weissblueth, Amira, Brezis, Faridi, Ali, & Katz, 2008).

For example, the health bone center's<sup>1</sup> representative who is responsible for the physical education curriculum in school will require a screening test every two months, and any student or teacher who reaches a good level of bone minerals, strong muscle, and good bone density will be rewarded with sport shoes, and each higher level of health and bone will receive sport and nutrition gifts, for example, a walking machine or prepaid

card for one semester in the school cafeteria. The same thing can apply in universities and all healthy bone facilities.

### **Social environment**

The individual level affected by the social environment that surrounds it has a huge impact on changing individual behavior, being physically active and consuming healthful food. Social environment consists of relationships, culture, and society, for example, family, relatives, friends, work partners (VCE, 2010).

Mother's Day is a good time to make activities for mothers and daughters, for example, walk and talk and encourage daughters to talk with their mothers about osteoporosis risk factors. Make an international family day for walking or playing games by inviting students with their parents to participate; it will be more effective if it is a part of school activity to encourage attendance.

In neighborhoods, seeing people active encourages others to be active. Practicing sport in a group will increase the likelihood to change and adopt behavior (Shuval et al., 2008). One study showed that while the social ecological model has multiple levels, the intrapersonal level is more effective to change behavior than interpersonal (e.g. attitude, self-efficacy). Female participants in one study reported that friends and peers encourage them to be active more than self-efficacy. Awareness as well as social support for physical activity trends (e.g., walking group) may gradually help to change social norms and may increase the likelihood of changing behavior. Health promotion campaigns invite religious high position women or actresses to participate to motivate females to have healthy lifestyles by eating nutritious food and engaging in physical activity

(Berger, & Peerson, 2009). Neighborhood activities in the program will encourage females to be involved in these activities, for example, having a dinner with healthful food at a local place, or as a potluck with participants bringing a favorite dish (Shuval et al., 2008), or having a neighborhood healthful delicious meal competition, with good incentives for participants.

Long-term strategies are needed to facilitate an effective change, especially in schools and universities by providing curriculum interventions and a supportive physical activities program for credits. Consistent evidence has been found that adolescent physical activity (PA) is positively associated with adult PA levels (Hawkins, Holt, Hossain, Rowel, Sydnor, & Divers, 2006) Also, teachers are required to have physical activity classes to improve their health and encourage students. Cafeterias in schools will be under a healthy bones center's observation. They should dispense desirable healthful food. Bimonthly screening tests should be required for both teachers and students; if they reach a good health level, they will earn a suitable gift, for example, sport shoes or ball. The availability of gifts increases with positive results. The program encourages students to make their own association for osteoporosis or healthy bone.

The bone health center should have an observational system. In it, hospitals and primary health centers will cooperate with the healthy bone center and send women with a deficiency of calcium or vitamin D or low bone density, women during and after lactation, and those older than 30. The center's staff will address her needs and make a program for her. There will be follow-ups and calls to remind women and make sure that they are comfortable with questions. Making a kindly, respectful relationship with the

patient will be effective to keep her on the program. Incentive is also important in this part.

### **Physical environment**

Before implementing the education and awareness program, it is important to have a welcoming environment. For example, it is impossible to encourage and educate people to walk if the environment does not contain safe walking paths (VCE, 2010). Qatif city and its villages lack the physical environment to not only enable people to participate but also to help change social norms (Shuval et al., 2008). Participants need appropriate facilities for physical activity and to get health information. It also is important to have main center for bone health in critical location with qualified staff and equipment. Under observation of this center will be recreational facilities to each area in proximal location in each village.

Those recreational facilities will be safe and culturally appropriate (e.g., separate facilities for women, with female instructors) (Shuval et al., 2008). Also, part of it should be an open place to get sun exposure if the weather is good and perform activities out there. Also, there should be glasses room if the weather is not good. We can call them sun stations or Vitamin D stations. There should be child care places nearby (Berger, & Peerson, 2009). The center should provide safe transportation at specific times along with facilities, sidewalks, and a socially acceptable venue for exercise. For example, beaches are good places for each village or each neighborhood to have adequate lighting, safe, and convenient proximal sidewalk or venue (Shuval et al., 2008), (Addy, Wilson, Kirtland, Ainsworth, Sharpe, & Kimsey 2004). Neighborhoods should be encouraged to

provide private recreation facilities with qualified professional staff to help females get involved in fitness, exercise, and physical education, and at a good price.

### **Policy**

Funds should be apportioned to make environmental, physical, and educational community changes (Report of the Osteoporosis Action Plan Committee to the Ministry of Health and Long-Term Care, 2003). These should include pharmacies, an educational health minister, healthy ministers, drugs and food administration, and public health administration to work with the healthy bones center and its services.

The healthy bones center should be have legal responsible to have activities in schools and have representatives in activities, schools, universities, and recreational facilities. The ministry of health change in the school and university environments should promote healthful eating and regular physical exercise and encourage healthy bone development among school-aged children and adolescents and in universities, and work with other ministries to facilitate changes in the school environment changes (Report of the Osteoporosis Action Plan Committee to the Ministry of Health and Long-Term Care, 2003)

Programs should incorporate kinesiology and physical education majors in universities for women to encourage behavioral change. They also should make it legal and easier for students to earn a license in physical education and fitness certificates.

### **Assumptions**

A prevalent health factor in Saudi Arabia is the excessive smoking habit (hookah) of Saudi women. One assumption of this study is that this obvious health concern is not



taken into account at all, which affects the validity and reliability of this study. Smoking is known to have been a major risk factor for osteoporosis and it is a major flaw of this study for not taking it into account. Also, air pollution plays a role, because oil and petroleum factories in that area affect the level of Vitamin D. More research is needed to understand risk factors and causes of osteoporosis in Saudi Arabia.

## References

- Addy, C. L., Wilson, D. K., Kirtland, K. A., Ainsworth, B. E., Sharpe, P., & Kimsey, D. (2004). Associations of perceived social and physical environmental supports with physical activity and walking behavior. *American Journal of Public Health, 94*(3), 440–443.
- Al-Hilali, M., Khan. Interpretation of the meanings of the noble of Quran in the English language. DARUSSALAM, summarized in one volume.
- Al Quaiz, A. M., Kazi, A., Tayel, S., Shaikh, S. A., Al-Sharif, A., Othman, S. ... Sulaimani, R. (2014). Prevalence and factors associated with low bone mineral density in Saudi women: a community based survey. *BMC Musculoskeletal Disorders, 15*(1), 5.
- Alissa, E. M., Qadi, S. G., Alhujaili, N. A., Alshehri, A. M., & Ferns, G. A. (2011). Effect of diet and lifestyle factors on bone health in postmenopausal women. *Journal of Bone and Mineral Metabolism, 29*(6), 725–735.
- Allali, F., Aichaoui, S. E., Saoud, B., Maaroufi, H., Abouqal, R., & Hajjaj-Hassouni, N. (2006). The impact of clothing style on bone mineral density among postmenopausal women in Morocco: A case-control study. *BMC Public Health, 6*(1), 135.
- Al-Nozha, M. M., Al-Hazzaa, H. M., Arafah, M. R., Al-Khadra, A., Al-Mazrou, Y. Y., Al-Maatouq, M. A. ... Al-Shahid, M. S. (2007). Prevalence of physical activity and inactivity among Saudis aged 30–70 years: A population-based cross-sectional study. *Saudi Medical Journal, 28*(4), 559-568.

- Al-Shahrani, F. M., Al-Zahrani, A. M., & Al-Haqawi, A. I. (2010). Knowledge of osteoporosis in middle-aged and elderly women. *Saudi Medical Journal*, *31*(6), 684–687.
- Anderson, D. S. L. C. E. (1999). Constructivism: A paradigm for older learners. *Educational Gerontology*, *25*(3), 203–209.
- Bayray, A., & Enquesselassie, F. (2013). The effect of parity on bone mineral density in postmenopausal women: A systematic review. *Journal of Osteoporosis and Physical Activity*.
- Ben-Ari, E. (2007). Osteoporosis (electronic resource). (Bethesda, Md.) : U.S. Department of Health and Human Services, National Institutes of Health, National Institute of Arthritis and Musculoskeletal and Skin Diseases. Retrieved from [http://permanent.access.gpo.gov/LPS110285/LPS110285\\_osteoporosis\\_hoh.pdf](http://permanent.access.gpo.gov/LPS110285/LPS110285_osteoporosis_hoh.pdf)
- Bener, A., Hammoudeh, M., & Zirie, M. (2007). Prevalence and predictors of osteoporosis and the impact of life style factors on bone mineral density. *APLAR Journal of Rheumatology*, *10*(3), pp. 227–233.
- Berger, G., & Peerson, A. (2009). Giving young Emirati women a voice: participatory action research on physical activity. *Health & place*, *15*(1), 117–124.
- El-Desouki, M. I. (2003). Osteoporosis in postmenopausal Saudi women using dual x-ray bone densitometry. *Saudi medical journal*, *24*(9), 953–956.

- Giordano, G. N., Björk, J., & Lindström, M. (2012). Social capital and self-rated health—a study of temporal (causal) relationships. *Social Science & Medicine*, *75*(2), 340–348.
- Hawkins, A. S., Holt, M. L., Hossain, M. B., Rowel, R. H., Sydnor, K. L., & Divers, S. P. (2006). Models for nutrition education to increase consumption of calcium and dairy products among African Americans. *Journal of nutrition*, *136*(4), 1103–1106.
- Hsieh, C. H., Wang, C. Y., McCubbin, M., Zhang, S., & Inouye, J. (2008). Factors influencing osteoporosis preventive behaviours: Testing a path model. *Journal of Advanced Nursing*, *62*(3), 336–345.
- Karaguzel, G., & Holick, M. F. (2010). Diagnosis and treatment of osteopenia. *Reviews in Endocrine and Metabolic Disorders*, *11*(4), 237–251.
- Kountz, D. S. (2009). Strategies for improving low health literacy. *Postgrad Med*, *121*(5), 171–177 <https://uni-illiad-oclc-org.proxy.lib.uni.edu/illiad/illiad.dll?Action=10&Form=75&Value=24989>
- Mabry, R. M., Reeves, M. M., Eakin, E. G., & Owen, N. (2010). Evidence of physical activity participation among men and women in the countries of the Gulf Cooperation Council: A review. *Obesity Reviews*, *11*(6), 457–464.
- McNeill, L. H., Kreuter, M. W., & Subramanian, S. V. (2006). Social environment and physical activity: A review of concepts and evidence. *Social Science and Medicine*, *63*(4), 1011–1022.

- Oommen, A., & AlZahrani, I. (2014). Prevalence of osteoporosis and factors associated with osteoporosis in women above 40 years in the Northern Part of Saudi Arabia. *International Journal of Research in Medical Sciences*, 2(1), 274–278.
- Osteoporosis Action Plan Committee. Osteoporosis action plan: an osteoporosis strategy for Ontario. Report of the Osteoporosis Action Plan Committee to the Ministry of Health and Long-Term Care [report on the Internet]. February 2003. Ministry of Health and Long-Term Care; Osteoporosis Society of Canada.[cited 2006 Oct. 15].
- Pena, A., & Perez, V. (2012). Osteoporosis (electronic resource): Risk factors, symptoms and management. *New York: Nova Biomedical*.
- Raef, H., Al-Bugami, M., Balharith, S., Moawad, M., El-Shaker, M., Hussain, A. ... Al-Badawi, I. (2011). Updated recommendations for the diagnosis and management of osteoporosis: A local perspective. *Annals of Saudi Medicine*, 31(2), 111.
- Riggs, B. L., & Melton Iii, L. J. (1995). The worldwide problem of osteoporosis: Insights afforded by epidemiology. *Bone*, 17(5), S505–S511.
- Saudi Arabia. (n.d). Retrieved from [http://www.iofbonehealth.org/sites/default/files/PDFs/Audit%20Middle%20East\\_Africa/ME\\_Audit-Saudi\\_Arabia.pdf](http://www.iofbonehealth.org/sites/default/files/PDFs/Audit%20Middle%20East_Africa/ME_Audit-Saudi_Arabia.pdf)
- Shuval, K., Weissblueth, E., Amira, A., Brezis, M., Faridi, Z., Ali, A., & Katz, D. L. (2008). Peer Reviewed: The role of culture, environment, and religion in the promotion of physical activity among Arab Israelis. *Preventing Chronic Disease*, 5(3).

Victorian Curriculum and Assessment Authority. 2010. VCE physical education (2011–2014) Unit 3: Socio-ecological model. Retrieved November 28, 2012, from <http://www.vcaa.vic.edu.au/vce/studies/physicaledu/phyeduindex.html#H2N1000>

B

Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: The evidence. *Canadian Medical Association Journal*, 174(6), 801–809.

---

<sup>i</sup> A main center for bone health in critical location in Qatif, Saudia Arabia with qualified staff and equipment.