

**Improving Patient Outcomes After A Suspected Osteoporotic Fracture:**

**Exploring New Zealand Orthopaedic Nurses' Knowledge Of Osteoporosis And  
Their Perception Of Their Role In The Prevention Of Osteoporosis And In The  
Diagnosis, Treatment, And Education Of Patients Presenting With A Suspected  
Osteoporotic Fracture.**

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## ABSTRACT

Osteoporosis is a highly prevalent yet preventable disease. Nurses can play a major role in the prevention of osteoporosis as well as in the preventative treatment of patients who have had a suspected osteoporotic fracture. A literature review revealed internationally that, nurses' knowledge of osteoporosis is at the same level than that of lay people. No literature regarding the knowledge of osteoporosis nurses in New Zealand have, has been found.

The purpose of this descriptive exploratory study is:

- i) To explore whether NZ orthopaedic nurses have the appropriate osteoporosis-related knowledge to provide osteoporosis prevention education,
- ii) To identify whether lack of knowledge of osteoporosis amongst nurses is a barrier in osteoporosis prevention,
- iii) To explore orthopaedic nurses' perception of their role in the diagnosis and prevention of osteoporosis,
- iv) To explore strategies to improve knowledge of osteoporosis with the aim to tailor educational material to the needs of nurses to improve the impact and effectiveness of the material.

An existing self-administered, web-based questionnaire developed to assess nurses' knowledge of osteoporosis was sent to a convenience sample of orthopaedic nurses affiliated with the New Zealand Orthopaedic Nurses Association. Participants were encouraged to pass the survey on to colleagues.

Data was analysed quantitatively for the Osteoporosis Knowledge Questionnaire, using descriptive statistics for socio-demographic data and a qualitative approach for the nurses' perception of their role, perceived barriers and educational preferences.

The findings reveal orthopaedic nurses in New Zealand have inadequate knowledge of osteoporosis and identify this as one of the barriers in the education of patients regarding osteoporosis.

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This thesis is dedicated to my niece Nicolet Melville who has fought and lost the battle against cervical cancer at the age of 25 (26/06/1985 – 8/10/2010).

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## CHAPTER ONE

### INTRODUCTION

#### 1.1 Introduction

Osteoporosis (OP) is a highly prevalent, yet preventable and treatable disease affecting both men and women. It is the most common bone disease today, with significant impact on morbidity and mortality (Smith, 2010). Osteoporosis has previously been seen as a silent disease that is part of the normal ageing process (Lane, 2009). Osteoporosis is a global problem increasing significantly with the increase in the ageing population of the world and identified as a complex, multi-factorial chronic disease that often progresses silently until a fracture occurs (Crowther-Radulewicz & McCance, 2010). At least 90% of peak bone mass is obtained at the age of 18 and low peak bone mass is an important risk factor for osteoporotic fractures, therefore osteoporosis is seen as a geriatric disease with adolescent onset (Munch & Shapiro, 2006). There are various factors that influence bone health. Modifiable risk factors include physical inactivity, eating disorders, lack of sunshine, estrogen deficiency, low calcium intake, and excessive alcohol intake. Non-modifiable risk factors include advanced age, family history, race and gender (Lane, 2009). The important role of calcium and vitamin D intake as well as weight-bearing exercises to maintain bone health and prevent osteoporosis has been evidenced.

Early identification of these osteoporosis risk factors and the development of effective prevention programs are required to stop the progress of the disease. Knowledge is the key important factor in the prevention of osteoporosis. However, it is believed that knowledge alone does not always predict life changing behavior and a person's health beliefs should also be taken into account (Terrio & Auld, 2002; Wallace, 2002). As frontline health promoters, nurses are in a vital position to play a major role in firstly the prevention of osteoporosis and secondly the prevention of subsequent fractures in patients who have presented with a primary osteoporotic fracture. However, lack of knowledge amongst health care professionals as well as lay people is evident in the research literature, especially in regards to risk factors and effective preventative measures (Amre, Safadi, Jarrah, Al-Amer, & Froelicher, 2008; Berarducci, 2004a; Berarducci, Lengacher, & Keller, 2002; Chen, Yu, Wang, Cheng, & Huang, 2005; Hannon & Murphy, 2007; Spencer, 2006; Vered, Werner, Shemy, & Stone, 2008; Ziccardi, Sedlak, & Doheny, 2004.).

Increasing nurses' knowledge about osteoporosis could help decrease fracture risk and therefore the burden of osteoporosis. Nurses' knowledge of osteoporosis and the perception of their role in the diagnosis, prevention and treatment of osteoporosis in New Zealand form the basis of this study.

This chapter provides an overview on the essential knowledge nurses need regarding osteoporosis including osteoporosis as a disease, the physiology and pathophysiology of osteoporosis, risk factors for osteoporosis, diagnosis of osteoporosis and recommendations for the prevention and treatment of osteoporosis. The burden of osteoporosis will also be highlighted.

## **1.2 Background**

Osteoporosis New Zealand [ONZ] (2007a) prepared a report on the burden of osteoporosis in New Zealand, predicting the effects of the disease up to 2020. This report was the first of its kind in NZ as the burden of osteoporosis on NZ has never before been quantified. ONZ states that severe or accelerated osteoporosis will be a significant health issue for the public health system due to the increased risk of fractures and the resultant significant decrease in quality of life and premature mortality, as well as increased cost. The report highlighted the importance of early detection for those who might be at increased risk of having osteoporotic fractures. The report furthermore suggests that if preventative actions such as education and lifestyle changes are initiated early, the health and financial burden of osteoporosis for New Zealand could be significantly reduced in the future. Any strategy that improves people's understanding of osteoporosis, particularly around risk factors and preventive measures, may significantly reduce the burden of osteoporotic fractures in the population (ONZ, 2007a). An audit was conducted in eight New Zealand Orthopaedic Departments (North Shore, Middlemore, Waikato, Palmerston North, Hutt Wellington, Christchurch and Dunedin) by Stacey-Clitherow & Bossley (n.d.), aimed at establishing osteoporosis intervention procedures in New Zealand Orthopaedic Departments for patients with osteoporotic fractures and concluded that osteoporosis is largely ignored by orthopaedic units in New Zealand. This study established that patients are not referred, diagnosed and treated for osteoporosis after presenting with a suspected osteoporotic fracture, making them susceptible for recurrent fractures.

### **1.2.1 The burden of osteoporosis**

Osteoporosis is viewed by Chan, Anderson, and Lau (2003) as the world's ticking time bomb, with millions of people affected worldwide. The World Health Organisation

[WHO] (2003) suggests that the main burden of osteoporosis results from fractures due to reduced bone mineral density and associated risk factors. It is estimated that at least 50% of American women over the age of 50 will suffer one or more fractures due to osteoporosis, including 17.5% for femoral neck fractures, 16% for compression fractures of the vertebral bodies and 16% for distal radius and ulna fractures (Berarducci et al., 2002). In New Zealand approximately 50% of women and between 15% and 30% of men will suffer osteoporotic fractures as they age (Gilchrist, 2006). Internationally the lifetime risk factor for osteoporotic fractures of the femoral neck, vertebral, or distal radius and ulna after the age of 50 years is 40% in women and 13% in men (Raisz, Kream, & Lorenzo, 2003). After one vertebral fracture, the risk of sustaining another fracture within 12 months increases four times (ONZ, 2007a). However, a survey conducted in 2006/2007 by the Ministry of Health [MoH] (2008) established that one in 34 adults in New Zealand had been informed by a doctor they have osteoporosis, equating to 90 000 adults. It is furthermore predicted that there is an osteoporotic fracture every six minutes in New Zealand which will lead to an increase from 80 000 fractures reported in 2007 to 120 000 fractures by 2020.

As the number of older New Zealanders (50+ years) increase, so too will the burden of disease on the public health system. Statistics presented by ONZ (2007a) regarding the extent of osteoporosis in New Zealand revealed an estimated 84,000 osteoporotic fractures occurred in 2007, with 60% of these in women. The estimated burden of fractures amongst the Maori and Pacific population was lower compared to Pakeha. The reason for this is thought to be the relative low numbers in the population, differences in life expectancy, genetic and cultural factors relating to diet and bone mass. The burden of osteoporosis is reflected in three aspects associated with fractures, namely mortality, morbidity and cost.

### 1.2.2 Mortality

Femoral neck fractures are identified as the most devastating consequence of OP, requiring hospitalisation and resulting in serious disability and increased 10-20% mortality over the first year following the fracture. The greatest risk of death is within the first six months post-fracture (Royal Australian College of General Practitioners [RACGP], 2010) and up to 20-30% during the first year following fracture (Johnell & Kanis, 2005). The risk of mortality is four times greater during the first three months post-fracture, with men having a poorer prognosis than women (Penrod, Smith, Terwilliger, & Gueldner, 2008). Although it is suggested that the high mortality rate due

to hip fractures are partly due to other comorbidities, 25% of deaths are causally related to the hip fracture itself (Johnell & Kanis, 2006).

### 1.2.3 Morbidity

The WHO (2003) states that the morbidity relating to osteoporosis arises from associated fractures resulting in an increased risk of serious functional impairment and institutionalisation. It has been established that 40-70% of people with osteoporotic fractures do not regain their pre-fracture mobility status within a year of the fracture and less than 50% regain pre-fracture ability to perform activities of daily living (ADL's) (Penrod et al., 2008). About 25% of formerly independent people will become dependent after a hip fracture (Berarducci et al., 2002), with one in five ending up in a rest home (Penrod et al, 2008). Morbidity related to fractures arise from pain, reduced mobility, loss of function and associated loss of quality of life, as well as loss of independence (RACGP, 2010). Penrod et al. (2008) adds losses in social and psychological well-being as a threat to morbidity. Morbidity is measured in terms of loss of quality of life, such as quality adjusted life years (QALY's), or by disability, such as disability adjusted life years (DALY's).

A significant reduction in quality of life has been associated with osteoporotic fractures. Reductions in QALYs are interpreted as the number of years lost due to osteoporosis adjusted for the reduced health state of the individual after a hip or vertebral fracture (ONZ, 2007a). As estimated by ONZ, the number of QALY's lost in New Zealand in 2007 due to osteoporotic fractures were nearly 2100 per year, and possibly due to the timing of the fracture and the difference in life expectancy, there were more life years lost for males (1175) than for females (935). This analysis ranks osteoporosis between lung cancer and colorectal cancer in terms of the number of DALY's lost (Johnell & Kanis, 2006). Prevention of osteoporosis and subsequent risk of hip fractures may contribute to increase life expectancy as well as preserving quality of life (Empana, Dargent-Molina, & Bréart, 2004).

### 1.2.4 Cost

In NZ 56% of women and 29% of men will suffer a fracture after the age of 60 because of osteoporosis. According to statistics provided by ONZ (2007a) it translated to the following:

- a) 231 osteoporotic fractures per day;
- b) 312 inpatients recovering from osteoporosis-related fractures;

- c) Treatment of fractures at a cost of \$325 000 per day; and
- d) Overall expenditure of over \$3 million per day.

Femoral neck fractures are the most costly with an average length of stay in an acute service in New Zealand estimated at 14 days and 70% admittance rate to a rehabilitation unit. The combined cost for the treatment of both femoral neck and vertebral fractures in New Zealand is estimated at \$118 million per year and other osteoporosis-related fractures at \$94 million. The total cost of osteoporosis was estimated to be over \$1.15 billion in 2007. Factors considered when estimating the cost included direct cost of treating a fracture resulting in either hospitalisation or not; medical and non-medical costs; treatment cost of osteoporosis and other conditions related to osteoporosis such as back pain. It is further predicted that misdiagnosis of osteoporosis can lead to significant expenditure of health care resources (ONZ, 2007a).

### **1.3 Defining osteoporosis**

Osteoporosis is a silent disease (National Osteoporosis Foundation [NOF], 2010) until it is complicated by an osteoporotic fracture, also known as an insufficiency, fragility or non-traumatic fracture (Saag, 2008). Osteoporosis is diagnosed by bone density testing (Watts, 2008). Osteoporosis, or porous bones, is a disturbance in the normal osteoblastic and osteoclastic balance in which the mineral and matrix components are diminished, resulting in a decreased number and width of trabeculae and bone mass. This loss of the micro-architectural structure results in fragile bones and fractures (Sedlak & Doheny, 2002). The definition of osteoporosis most commonly used in literature was established in 1990 by a consensus development conference on osteoporosis. This diagnosis comprehends the core of osteoporosis as “a disease characterised by low bone mass and micro-architectural deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk” (Conference Development, 1991, p. 107; Raisz et al., 2003; WHO, 1994, p. 3.).

Osteoporosis is generally considered in terms of the amount of bone present. The World Health Organisation (WHO) classifies osteoporosis on measurement of bone mineral density (BMD) within two norms, namely of women as compared to the average peak BMD of a healthy young adult of the same sex (T-score) or the expected BMD for the patient's age and sex (Z-score) (NOF, 2010). Deviation from this average or statistical mean is then calculated in standardised units or standard deviations (SD). Women with a BMD score within 1 SD of the mean are considered to have a normal

BMD. A BMD score of more than 1 SD but less than 2.5 SD below the young adult mean is classified as osteopenia or decreased bone mass. Osteoporosis is present when the BMD is 2.5 SD or more below the young adult mean. Severe or established osteoporosis is identified when the BMD is more than 2.5 SD below and there has been an osteoporotic fracture (WHO, 1994).

#### **1.4 Typical osteoporotic fractures**

The most common osteoporotic fractures are those of the neck of femur, the vertebral bodies, and the distal third of the radius and ulna (Saag, 2008). However, other fractures may also be included (Johnell & Kanis, 2005). In New Zealand Pakeha constitute 92% of all fractures and Maori 4%, and fractures in Pacific and Asian people the remaining 4% of the total. Women sustained 70% of the reported fractures (ONZ, 2007a). Femoral neck fractures were estimated to account for 5% of all osteoporosis-related fractures in New Zealand. An estimated 3803 femoral neck fractures, 27994 vertebral fractures and 52556 other osteoporosis related fractures occurred in New Zealand in 2007, added to a total of 84354 (ONZ, 2007a). Between 18-26% of postmenopausal Caucasian women have a vertebral deformity related to vertebral fractures, and 1% of women at the age of 65 and 2.9% between the ages of 75-79 years sustain a new vertebral fracture each year (Johnell & Kanis, 2005). The importance of vertebral fractures, according to Johnell and Kanis, involves morbidity and the risk factor for new fractures. Penrod et al. (2008) state that curvature of the spine and loss of height following vertebral body fractures resulting in loss of structure of the spine and ribcage can create intra-abdominal pressure on organs and inhibit breathing patterns. Wrist fractures are a predictor of future hip fractures (Penrod et al., 2008).

#### **1.5 The physiology and pathophysiology of osteoporosis**

Processes at multiple biological levels such as peak bone mass, alterations in bone remodeling, and environmental influences play a role in osteoporosis (Sambrook, 2008). Bone remodeling is a continuous dynamic process where old bone is replaced with new bone (Manolagas, 2000) in order to maintain the internal structure of bone (Crowther-Radulewicz, 2010). Remodeling can be activated by both systemic and local factors as well as changes in mechanical forces (Raisz et al., 2003).

During childhood and teenage years new bone is added faster than old bone is removed, giving bones a larger, heavier and denser appearance. Bone formation continues at a pace faster than resorption until peak bone mass is reached at

approximately age 30, after which bone resorption starts to slowly exceed bone formation. The remodeling cycle in adults can last 4-6 months (Lane, 2009). With ageing the bone remodeling cycle takes longer to complete and the rate of mineralisation slows down (Crowther-Radulewicz, 2010). The balance in the remodeling cycle is easily disturbed and physiological deviations such as lack of exercise may lead to osteoporosis (Solomon, Warwick, & Nayagam, 2001). A number of metabolic changes such as estrogen deficiency, immobilisation, metabolic acidosis, hyperparathyroidism, and systemic and local inflammatory diseases can increase osteoclast activity, resulting in greater bone resorption than bone formation and a net loss of bone tissue (Lane, 2009).

There is a significant relationship between low bone mineral density and the incidence of osteoporotic fractures (WHO, 2003). Osteoporosis develops when the remodeling cycle is disrupted (Crowther-Radulewicz & McCance, 2010) and the rate of bone resorption becomes greater than the rate of formation (Sedlak & Doheny, 2002). Solomon et al. (2001) suggests that rapid bone loss leading to osteoporosis is usually due to excessive resorption rather than diminished formation. Decreased bone mass resulting in increased fragility occur due to factors such as failure to achieve peak bone mass by age 30, bone loss due to increased resorption or inadequate replacement of lost bone and decreased bone formation (Raisz et al., 2003).

Osteoporosis is three times more common in women than in men due to lower peak bone mass and hormonal changes after menopause. Sambrook (2008) suggests that menopausal status is the most important risk factor and post-menopausal bone loss is considered to be the most important cause of osteoporosis with early menopause seen as the greatest risk. In women, bone loss is most rapid in the first years after menopause but persists throughout the post-menopausal years and by age 70, susceptible women are believed to have lost 50% of their peripheral cortical bone mass, leading to a high fracture risk (Crowther-Radulewicz, 2010). Estrogen plays a role in preserving bone mass during adulthood. Bone loss occurs as estrogen levels decline usually around the age of 50 years (WHO, 2003). The lower risk of osteoporosis for men are associated with larger bones and greater peak bone mass at maturity (Ford, Bass, & Keathley, 2007).

## **1.6 Risk factors for osteoporosis**

Osteoporosis is a preventable disease. Identifying and modifying risk factors is an important part of the management and reduction of the incidence of osteoporosis, as

well as in increasing awareness of osteoporosis (Berarducci et al., 2002). Although osteoporosis has been considered to mainly affect Pakeha/European postmenopausal women, it is suggested that due to an increase in life expectancy, the incidence of osteoporotic fractures will rise amongst all populations (Raisz et al., 2003). Raisz et al. suggest that due to increasing industrialisation resulting in decreased physical activity, the age-adjusted incidence of femoral neck fractures around the world is on the increase. There are non-modifiable and modifiable risk factors identified for osteoporosis and osteoporotic fractures.

#### 1.6.1 Non-modifiable risk factors

- a) Age: Fracture risk is strongly affected by age and doubles with each decade (RACGP, 2010). The WHO (2003) suggests that women develop an accelerated bone loss around menopause due to reduced estrogen levels.
- b) Race: osteoporosis is more common in Caucasian and Asian women than in African-Americans and Hispanics, and more common in women than in men (South-Paul, 2004). Sambrook (2008) suggests that people of Asian origin have lower bone densities and higher fracture rates than Caucasians. However, New Zealand statistics show that fractures due to osteoporosis in Pakeha/Europeans were 30% higher than that in Maori, Pacific and Asian people (ONZ, 2007a). It is suggested that factors such as bone mass are responsible for most of the ethnic variation in adult BMD (South-Paul, 2004).
- c) Body mass index: low body weight and weight loss are important factors in osteoporotic fractures (Raisz et al., 2003). It is suggested that low body weight is more associated with hip fractures than overweight (Sambrook, 2008). Anorexia nervosa is associated with a low BMD which does not increase to normal after recovery from anorexia; therefore people with an eating disorder remain at high risk for osteoporosis (South-Paul, 2004).
- d) Genetics: there is a strong genetic contribution to skeletal size and composition (Sambrook, 2008). A family history of osteoporotic fractures is strongly associated with a fracture risk (WHO, 2003).
- e) Drugs: Many drugs lead to reduced BMD, increasing the risk of osteoporosis (Sambrook, 2008). Medications such as thyroxin, glucocorticoids, and use of certain anti-convulsion and anti-coagulant drugs can increase the risk for osteoporosis (Sambrook, 2008).

### 1.6.2 Modifiable risk factors

- a) Life style: Low dietary intake of calcium, cigarette smoking, excessive consumption of alcohol, and a sedentary lifestyle are all contributing factors in the development of osteoporosis (Skugor, 2010).
- b) Physical activity: Mechanical forces exert strong influences on bone shape and remodelling as it promotes osteoblast growth and activity (Sambrook, 2008). Bone requires weight bearing to regenerate, and without the normal mechanical stress associated with ambulation such as in immobilisation or space flights, bones demineralise.
- c) Hypogonadism: early menopause or surgical oophorectomy without initiation of hormone replacement therapy (HRT) is a significant risk factor for osteoporosis. Exercise induced amenorrhea in the pre-menopausal woman and amenorrhea due to anorexia nervosa falls in the changeable category (Sambrook, 2008). Estrogen deficiency accelerates the rate of bone turnover, altering the balance between bone formation and bone resorption in women in their fifth decade (WHO, 2003).

## 1.7 Prevention and treatment of osteoporosis

Prevention is the best way to address osteoporosis (Chan et al., 2003). Addressing the modifiable risk factors for osteoporosis reduces the risk for developing osteoporosis. Osteoporosis New Zealand [ONZ] (2007b) recommends that health professionals should encourage patients to consider prevention and active intervention strategies for osteoporosis. Various guidelines regarding the prevention and treatment of osteoporosis have been written by Gueldner, Grabo, Newman, and Cooper (2008), the National Osteoporosis Foundation (NOF, 2010), Osteoporosis Australia [OA] (2008), ONZ (2007b) and the WHO (2003). The WHO states that the aim of intervention should be to prevent bone loss in individuals at risk of osteoporosis or in patients diagnosed with osteoporosis.

However, since osteoporosis is seen as a paediatric disease with a geriatric outcome (Munch & Shapiro, 2006), prevention of osteoporosis should start early in childhood. Prevention should therefore aim at maintaining a healthy lifestyle, a balanced diet to achieve adequate calcium and vitamin D and physical activity such as weight-bearing exercise. These lifestyle changes are paramount in the prevention and management of osteoporosis. Apart from lifestyle changes, osteoporosis treatment aim to prevent

fractures, stabilise bone mass, relieve symptoms of fractures and skeletal deformity and maximise physical function (Grabo & Longyhore, 2008).

#### 1.7.1 Nutrition

It is believed that 20% of New Zealanders have an inadequate calcium intake which is estimated to be higher among women 15-18 years old (Reid and Grainger, 2008). Nutritional status in childhood and adolescence play a role in bone mineralisation. Measures to prevent osteoporosis, as suggested by South-Paul (2004), should start early in the lifecycle with improving nutritional status to increase bone mineralisation. Calcium along with other nutrients are essential for bone health, therefore adolescents should maintain a balance between the intake of calcium, protein, and phosphorus (South-Paul, 2004). Children and adolescents aged 9-18 require a total calcium intake of 1000-1300mg per day. Adults require at least a 1000mg per day whilst women over 50 and men over 70 years of age require at least 1300mg per day (OA, 2008).

Vitamin D is a critical component in bone health (Sambrook, 2008). Together with calcium, vitamin D is essential to maintain bone mass and reduce fracture risk (WHO, 2003) as well as maintaining serum calcium and phosphorus levels (Smiciklas-Wright & Wright, 2008). Vitamin D is needed for calcium absorption and is mainly synthesised through the skin from daily 15-30 minute exposure to sunlight (WHO, 2003). An estimate of 400-800IU of vitamin D per day is required (OA, 2008).

#### 1.7.2 Lifestyle

Lifestyle factors that affect bone health have been discussed, including a balanced, healthy lifestyle such as the role of physical activity and a diet rich in calcium.

##### 1.7.2.1 Physical activity

Bone is responsive to physical strain as evidently exercise stimulates skeletal growth, therefore bone health. Mechanical forces have been identified to exert strong influences on bone shape and modeling (Sambrook, 2008). Research has shown that when mechanical forces or gravitational forces are removed, bone loss is rapid and extensive. Such is the risk with long-term immobilisation, space travel and paralysis (South-Paul, 2004). Physical exercise such as walking, jogging, and stair climbing can reduce risk and delay the physiological decrease of BMD. Swimming is not a weight-bearing activity, therefore questionable as having value to the maintenance of bone density (South-Paul, 2004). Chan et al. (2003) adds aerobic exercise and t'ai chi, suggesting these are the best form of exercise to stimulate bone formation and

strengthen the muscles. OA (2008) states that regular, progressive, fairly vigorous and variety of exercises is required to affect bone health.

When started early in life, exercise plays an important role in reaching peak bone mass, reportedly even more than dietary calcium intake (Lesperance, 2008). It also sets the trend for exercise later in life. Chan et al. (2003) supports this, stating that practicing exercise at a young age helps to maximize BMD while they are still growing and maturing, whilst continuing exercise minimises bone loss in later life. To be beneficial, exercise should be at least 30-60 minutes in duration at least three times a week (South-Paul, 2008). Regular moderate physical activity is also beneficial for weight control and stress reduction. However, excessive exercising result in exercise-induced amenorrhea in young women and should be avoided because estrogen deficiency could result in diminished bone density (South-Paul, 2004). Health care providers should encourage regular weight-bearing exercises as part of their role in the prevention of osteoporosis.

#### 1.7.2.2 Balanced, healthy lifestyle

Both smoking and the use of excessive amounts of alcohol have a harmful effect on bone health. Patients should be advised to quit smoking and take alcohol in moderate amounts only. Moderate intake of alcohol does not pose a negative effect on bone; it is actually associated with a slight increase in bone density and a lower risk of fracture in post-menopausal women. High alcohol intake however, is further associated with a high falls risk and subsequent fractures (NOF, 2010). In regards to smoking, it has been shown that the BMD of women who smoke diminishes by about 2% for each 10 year increase in age with a 6% difference by the age of 80 years (WHO, 2003; ONZ, 2007a).

#### 1.7.3 Pharmacologic agents

The mechanism of anti-resorptive agents such as bisphosphonates, estrogen, selective estrogen receptor modulators (SERM's) and calcitonin is believed to be decreased osteoclast progenitor development and/or decreased osteoclast recruitment and promotion of apoptosis of mature osteoclasts. This mechanism slows down the rate of bone remodeling (Manolagas, 2000). Recommendations and government support for treatment in New Zealand include bisphosphonates which replaced hormone replacement therapy as first line treatment for osteoporosis ONZ, 2007b).

Bisphosphonates, of which alendronate is now fully subsidised in New Zealand (ONZ, 2007b) have been shown to be effective in reducing hip fractures in postmenopausal women (Gilchrist, 2006). Evidence suggests that bisphosphonates decrease bone resorption, increase bone mass in both the spine and hip, and decrease the incidence of fractures (Raisz et al., 2003). Alendronate is effective in decreasing fracture risk at all sites with 50% within a few months of starting treatment. A combination of bisphosphonates with adequate calcium and vitamin D supplementation are more beneficial than taking calcium and vitamin D alone (ONZ, 2007b). Due to poor oral absorption, bisphosphonates must be taken on an empty stomach with water and no food or other medication for at least 30 minutes (Raisz et al., 2003; Watts, 2008).

Estrogen deficiency has been associated with bone loss (Sedlak & Doheny, 2002). Hormone replacement therapy (HRT) reduces the risk of clinical vertebral and hip fractures by 34% and other fractures by 23%. However, long term use of HRT is associated with cardiovascular disease, stroke, pulmonary embolism and breast cancer (ONZ, 2007b; Reid & Grainger, 2008).

Serum estrogen receptor modulators (SERM's) such as Raloxifene are known to maximise the effect of estrogen on bone but minimise the negative effects on the breast and endometrium. It reduces the risk of vertebral fractures and increase BMD of the spine and femoral neck (Sedlak & Doheny, 2002). Raloxifene use reduced vertebral fractures up to 50% after four years of treatment (Gilchrist, 2006).

Calcitonin acts directly to reduce bone resorption and increase bone mass in the vertebrae by binding to specific receptors of osteoclasts (Watts, 2008). A dose of 200 units per day is evidently the most effective to significantly reduce fractures (Raisz et al., 2003).

## **1.8 Summary**

Challenges in the prevention of osteoporosis include under-diagnosis and under-treatment combined with a perceived lack of knowledge amongst health care professionals and patients regarding risk factors for osteoporosis. With the increase in the number of older people (50+ years) in New Zealand, it is estimated that both the number of osteoporotic fractures and the cost of healthcare associated with osteoporosis will increase by over 30% between 2007 and 2020, therefore increasing the burden of disease on the public health system (ONZ, 2007a). Therefore prevention of osteoporosis is of critical importance.

Recommendations for the prevention and management of osteoporosis have been published by Osteoporosis New Zealand (2007b), and the WHO (2003). The role of the nurse in the prevention of osteoporosis has also been identified and described by Osteoporosis Australia (2008).

### **1.9 Research Question**

To enable nurses to improve outcomes of patients with osteoporosis and suspected osteoporotic fractures, there is a need to explore what knowledge nurses in New Zealand have of osteoporosis and what they perceive to be their role in the prevention of the disease.

The research question on which this study is based is:

What are New Zealand orthopaedic nurses' knowledge of osteoporosis, their perceptions of their role in the prevention of osteoporosis, and in the diagnosis, treatment and education of patients presenting with a suspected osteoporotic fracture?

### **1.10 Objectives and aims**

#### **1.10.1 Overall Objective**

This study aims to identify the gaps in orthopaedic nurses' knowledge and areas where change is needed, such as the barriers which prevent nurses from delivering osteoporosis education to lay people and clients. This study also seeks to establish whether nurses can fill the current gaps in the diagnosis and treatment of patients who present with a suspected osteoporotic fracture as is suggested by national (ONZ, 2007b) and international (WHO, 2003) guidelines.

#### **1.10.2 Specific Aims**

The aims of this project are to establish the osteoporosis knowledge level in a convenience sample of members of the New Zealand Orthopaedic Nurses Association (NZONA) to establish the following:

- i) To explore whether they have the knowledge necessary to provide osteoporosis prevention education;
- ii) To explore whether a lack of knowledge of OP amongst orthopaedic nurses is a barrier in osteoporosis prevention; and

- iii) To explore nurses' perception of their role in the prevention of osteoporosis and the diagnosis, treatment and education of patients presenting with a suspected osteoporotic fracture.

### **1.11 Significance of this study**

The prevalence of osteoporosis is expected to escalate and intervention by health care professionals, especially nurses, is needed. In order to deliver education, health care professionals are expected to have more knowledge of osteoporosis than their clients. With this in mind, studies regarding nurses' knowledge of osteoporosis will become increasingly important (Lai, Chua, Chan, & Low, 2008). As stated by Berarducci et al. (2002), it is imperative to examine whether nurses have appropriate osteoporosis-related knowledge necessary to provide prevention education for individuals throughout the lifespan.

No international or NZ-based study specifically aimed at orthopaedic nurses' knowledge of osteoporosis could be located. Therefore, as the first study of this nature in New Zealand, this research will provide New Zealand data, adding to existing international studies regarding nurses' knowledge of osteoporosis. This study presents the opportunity to compare NZ nurses' knowledge with that of other countries as well as to explore New Zealand Orthopaedic Nurses (NZON) current practice regarding the disease. This may be a valuable resource to government and nursing training agencies to improve nurse's disease prevention strategies which could aid in reducing the burden of osteoporosis in New Zealand.

Understanding current osteoporosis knowledge and the needs of nurses with respect to osteoporosis knowledge would provide a framework for future curriculum development. Results from this study could highlight strategies to improve knowledge of osteoporosis. The ultimate aim would be to develop educational resources to meet the needs of nurses to improve the impact and effectiveness of education and the prevention of osteoporosis. Increasing orthopaedic nurses' awareness of osteoporosis could help decrease osteoporosis and fracture risk.

### **1.12 The limitations of the study**

Due to the large population of nurses working on orthopaedic wards in New Zealand, the study was restricted to the members of NZONA. Due to distance between the researcher and the target population, lack of control from researcher, time constraints, lack of interest and possible inaccessibility there was a potential for the sample size to

be inadequate for generalisation and may limit the validity of the study. Using a questionnaire to obtain data versus interviews may have been a limitation due to the potential lack of depth in answering open-ended questions. The use of a convenience sample and not a randomised sample may have affected the extent to which the results from this study could be generalised to all nurses.

### **1.13 Overview of the Thesis**

#### 1.13.1 Chapter One: Introduction

This chapter provides a background of the study and the prevalence of osteoporosis. The significance of the study is explored and the research aims and the research question are described.

#### 1.13.2: Chapter Two: Literature review

A comprehensive review of international and national literature on nurses' knowledge of osteoporosis as well as the knowledge of lay people in regards to osteoporosis is described in this chapter.

#### 1.13.3 Chapter Three: Methodology

The design selected for this study, sampling, participant recruitment and ethical considerations are described in this chapter. Data collection and analysis methods are discussed.

#### 1.13.4 Chapter Four: Results

This chapter presents the research findings of socio-demographic data, osteoporosis knowledge and open-ended questions regarding perceptions and attitudes regarding nurses' roles in osteoporosis prevention.

#### 1.13.5 Chapter Five: Discussion.

In this chapter the findings will be analysed and discussed in relation to the research question and other studies on the same topic.

#### 1.13.6 Chapter Six: Conclusion and Recommendations

In this chapter the research question will be revisited and a summary of the findings presented. Conclusions from the study will be presented, limitations of this study and recommendations for further study will be discussed.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Introduction

Osteoporosis is a highly prevalent, but preventable disease affecting men and women. Two studies (Vered et al., 2008 and Vaile, Sullivan, Bennett, & Bleasel, 2007) have revealed that patients who sustained a suspected osteoporotic fracture were not diagnosed and treated for osteoporosis, mainly because health care professionals were either not equipped or uncertain about their role in the prevention, diagnosis, and treatment of osteoporosis and subsequent fractures. Nurses can play an important leading role in the education of clients regarding the disease. Yet, as has been identified by Giangregorio, Fisher, Papaioannou, and Adachi (2007) no research to date has explored osteoporosis knowledge and information needs in healthcare professionals who are directly involved in the management of patients with osteoporotic fractures. The knowledge levels of professionals involved in the prevention and treatment of the disease needs to be assessed, as it can aid in decision-making processes regarding health practices (Werner, 2005).

The aim of this study is to identify gaps in New Zealand orthopaedic nurses' existing knowledge of osteoporosis, their perceptions of their role in the prevention of osteoporosis and in the diagnosis, treatment and education of patients presenting with a suspected osteoporotic fracture. Literature published regarding this and aspects important to the prevention of osteoporosis are discussed in this chapter.

#### 2.2 Search Strategy

Both manual and computerized search methods were used. The scope of the literature included hard copies of refereed journals and on-line journals, any published studies related to the topic, and the reference list of relevant studies. Search filters applied included English language, full text only, and publication years ranging from 1998 to 2010; however relevant studies prior to this time period found on other sources were scrutinized for their applicability to this study.

Keywords used in the search were osteoporosis, orthopaedic nurses' knowledge of osteoporosis, nurses' knowledge of osteoporosis, osteoporosis knowledge, nurses' role in the prevention of osteoporosis, nurses' perception of their role in the diagnosis and treatment of osteoporosis, nurses' perception of their role in the prevention of

osteoporosis, literature review of osteoporosis knowledge, osteoporosis in New Zealand Maori, osteoporosis in New Zealand, and the screening and treatment for osteoporosis.

The search was conducted using databases as follows: Cumulative Index to Nursing and Allied Health Literature (CINAHL), EBSCOhost, Proquest, MD Consult, Google, Google Scholar, Science Direct, and PubMed. E-journals were accessed using Eastern Institute of Technology (EIT) Twist Library and Tairāwhiti District Health (TDH) Library, including journals such as Orthopaedic Nursing, Journal Of Orthopaedic Nursing, Journal of Bone and Joint Surgery (JBJS), and websites including [www.nof.org](http://www.nof.org); [www.who.int](http://www.who.int); [www.interscience.wiley.com](http://www.interscience.wiley.com); [www.acc.co.nz](http://www.acc.co.nz); [www.nos.org.uk](http://www.nos.org.uk); Index New Zealand website; and the NZ Guidelines Group.

In regards to inclusion criteria, the original intent of the literature search was to find studies regarding nurses' knowledge and perception of osteoporosis. Due to the limited number of studies found, the search was expanded with two new keywords, 'attitudes' and 'awareness', as well as including other targets such as other health care professionals and women of various cultures. Studies selected for this literature review include mainly primary studies with research designs ranging from observational, descriptive (cross sectional and survey), and survey questionnaires. One systematic review conducted by Werner (2005) is included due to its relevance to this study. A non-experimental descriptive study conducted by Hunt and Repa-Eschen (1998) and Ailinger and Emerson (1998) are included due to their importance and relevance to the topic.

Schneider, Whitehead, Elliott, Lobiondo-Wood, and Haber (2008) define a review of the literature as a systematic and critical review of published papers on a particular topic of interest in a discipline. The literature in this study was divided into several categories. These were studies related to the knowledge of osteoporosis; studies related to the gaps in the diagnosis and treatment of osteoporosis, and studies regarding the importance of osteoporosis prevention including the importance of calcium and vitamin D in osteoporosis prevention.

Included in the literature review are studies conducted among non-clinical populations as it is important for nurses to be aware of the knowledge and educational needs of their clients. Awareness of these aspects will aid in the successful implementation of an educational program.

### **2.3 Nurses' knowledge of osteoporosis.**

No New Zealand studies regarding nurses' knowledge of osteoporosis were found, however a study conducted amongst New Zealand women by Von Hurst and Wham (2007) and a study including women in Christchurch by Spencer (2006) was found. Only a limited number of international studies about nurses' knowledge were available and selected due to their relevance. A number of other studies about women's osteoporosis knowledge were conducted and will be included in this review for the purpose of comparison.

Hunt and Repa-Eschen (1998) conducted a non-experimental descriptive study amongst USA registered nurses (RNs) working in acute, ambulatory and long-term care in regards to factors such as assessment of learning needs of registered nurses for osteoporosis education. The study concluded that participants' knowledge of OP was less than adequate, emphasizing the need for continuing education to inform nurses about OP prevention, detection and management.

Although other osteoporosis-related studies were conducted prior to a study by Berarducci et al. (2002), there were no studies regarding nurses' knowledge of osteoporosis. Berarducci et al. assessed RNs in a quasi-experimental study regarding the impact of osteoporosis continuing education on nurses' knowledge and attitude, and reported evidence of a lack of knowledge that may negatively impact on the likelihood of RNs to engage in preventative behaviors. The study conducted a pretest and post-test using the Osteoporosis Knowledge Questionnaire (OKQ). The participants were 81 RNs attending a continuing education symposium on women's health issues in Southwest Florida. The participants were given written information about the study at registration to the symposium, and then given a pretest immediately before an educational program. The participants were then given a post-test after completing the program. Descriptive statistics were used to analyze the data. Paired-sample *t*-tests were used to examine changes in osteoporosis knowledge from pretest to posttest. Although the participants were predominantly mid-life women, with a mean age of 50.7, and 91% indicated that they visited a medical professional at least annually, only 49% indicated that a doctor discussed OP risk factors with them. More than half (54%) reported their doctor had not discussed prevention measures, and 91% reported never having a bone density scan. The study revealed significantly higher osteoporosis-related knowledge scores at post-test (mean = 20.02, SD = 1.65) compared to the pretest (mean = 13.35, SD = 3.31) out of a possible 22 correct answers. The questions most frequently answered incorrectly were those regarding risk

factors, disease prevalence, recommended daily intake of calcium, and physical signs of OP.

In 2004 Berarducci repeated the study using the same questionnaire (OKQ) to assess senior nursing students' knowledge of osteoporosis. The study design was descriptive with a convenience sample from senior nursing students at a university on the west coast of Florida. Knowledge scores for the sample ranged from 6 to 20, with a mean of 14.62 out of a possible score of 22. The study concluded that senior nursing students demonstrated limited knowledge of osteoporosis regarding the magnitude and risk factors of the disease, the detection, treatment and preventive measures. Recommendations were the enhancement of existing curricula to adequately prepare nurses to assume advocacy in both the practice setting and public arena regarding osteoporosis (Berarducci, 2004).

A similar study was conducted by Ziccardi et al. (2004) regarding knowledge and health beliefs of college nursing students. The purpose of this study was to describe college students' knowledge of OP, health beliefs regarding OP, self-efficacy to perform OP-preventing activities and actual performance of OP preventing activities. The sample consisted of 194 baccalaureate nursing students (including 11 male students) at a university in northeast Ohio, USA. For the purpose of comparison they selected first year and final year students. The design was descriptive using a survey questionnaire method including the Osteoporosis Preventing Behavior Survey (OPBS), the Osteoporosis Knowledge Test (OKT), the Osteoporosis Health Belief Scale (OHBS), and the Osteoporosis Self-Efficacy Scale (OSES). Possibly due to exposure to information via the curriculum, senior nursing students were found to be more knowledgeable about OP compared to first year students, and more confident about performing osteoporosis-preventing behaviours. Regardless of knowledge, there were no significant differences between the groups regarding their health beliefs about OP, their performance of weight-bearing exercise, dietary calcium intake or intake of caffeinated products. Regarding self-efficacy, the study found that there was no correlation between the levels of OP knowledge and exercise habits, indicating that a person's confidence to perform OP-preventing behaviors does not necessarily translate into actual performance of behaviors.

Chen et al. (2005) described OP as one of the most important health problems of the century. A cross-sectional study of 539 public health nurses (PHNs) in Taiwan found participants had only moderate knowledge of OP. The Scale of Osteoporosis

Knowledge (SOK) questionnaire used was a 50 item self-report scale designed to evaluate the participants' knowledge of OP. Less than half (31.1%) of the PHNs accomplished 80% of the maximum score, with the category on prevention scoring the highest at 80%. The lowest scores were in the categories regarding OP incidence, pathophysiology, diagnosis and signs/symptoms, scoring 78%, 70%, 63% and 51% respectively. The study found that participants who had studied osteoporosis previously had higher knowledge scores, thus recommending continuing nursing education including aspects such as signs/symptoms, diagnosis/treatment and prevention as core components of the curriculum.

Major areas of knowledge deficit identified by Giangregorio et al. (2007) among participants working in various orthopaedic-related departments were with topics related to health promotion and management specific to calcium needs and medication. Giangregorio et al. used a convenience sample of all health care professionals (HCPs) working in fracture clinics, orthopaedic wards, rehabilitation wards and nuclear medicine in a large multi-site hospital in Canada to assess osteoporosis knowledge and information needs in HC's caring for patients with osteoporotic fractures. The study used a modified version of the OKQ, reflecting Canadian OP prevalence statistics, omitting a question regarding colon cancer (question 20 in Berarducci et al., 2002) and adding a question regarding re-fracture risk (question 22). The mean score out of a possible 22 was 13.4, with the scores ranging from 6-20. More than 90% of participants were able to correctly identify the definition of OP, calcium intake requirements and that treatment is available to prevent bone loss. More than 70% of participants understood that osteoporotic fractures are a risk for future fractures, loss of height is a sign of OP, bone densitometry is a diagnostic tool for OP, prednisone increases OP risk and which exercises were considered weight-bearing.

In a quantitative, descriptive survey Hannon and Murphy (2007) used the Facts on Osteoporosis Quiz (FOOQ) on a stratified, random sample of 128 nurses' and midwives' in Ireland to assess their knowledge of risks and lifestyle factors associated with osteoporosis. Chi-Square analysis was conducted to ascertain whether there were statistically significant differences between scores on the FOOQ and age, post-graduate qualifications, years of experience, area of work, sex, and lifestyle factors affecting osteoporosis. This analysis indicated that there was a positive correlation between the number of year's post-qualification and knowledge. Interestingly, it reported that there was no statistical link between having a post-graduate qualification

in orthopaedics and scores on the FOOQ. This study draws the same conclusions as Hunt and Repa-Eschen (1998) and Berarducci et al. (2002), namely that nurses' knowledge of OP is less than adequate, with respondents having a poor knowledge regarding prevention strategies such as diet and activity. Hannon and Murphy (2007) found it alarming that rather than formal education, sources of information were mainly from unreliable, non-scientific based media sources. A similar hospital-based cross sectional study by Olayinka et al. (2007) conducted amongst health workers in Nigeria supported that nurses lack knowledge of OP and concluded that health workers' understanding of risk factors, methods of prevention, and consequences of osteoporosis related minimal trauma fractures was low.

Similar to the studies of Berarducci (2004) and Ziccardi et al. (2004), Amre et al. (2008) conducted a cross-sectional study of fourth year baccalaureate nursing students at a university in Jordan. The aim of the study was to explore the students' knowledge of OP using a 23-item-knowledge questionnaire. The items were categorized into three domains of knowledge, namely general knowledge (five items), pathophysiology (seven items) and prevention (eleven items). Correct answers to the questionnaire ranged from 7 to 18 out of a possible 23, with a mean score of 12.65 (54.9%) and SD 10.34. Most students (96.5%), were unable to identify that bone loss starts early in the 30's. Only 48.2% of the students could identify the meaning of OP as porous bones. Very few students (16.5%) identified loss of height as a sign of OP. Only 23.5% demonstrated knowledge of the recommended daily intake (RDI) of calcium and its role in the prevention of OP. In the pathophysiology domain, 55.3% of students were unable to choose the correct answers. Mixed results were evident with the prevention domain. Students were knowledgeable regarding dietary sources of calcium, but demonstrated less knowledge regarding lifestyle and the importance of exercise. However, knowledge regarding prevention scored the highest, with a mean score of 14.32 (62.27%). The authors concluded that graduating nursing students have limited knowledge to undertake the role of health promotion and disease prevention with respect to OP in the community. They acknowledged that the questionnaire was developed for a different culture and language barrier were limitations to this study. However, the conclusion was similar to Berarducci (2004) and Chen et al. (2005) regarding the need for education for nurses regarding osteoporosis.

Vered et al. (2007) conducted a cross-sectional study examining nurses' knowledge and perceptions about osteoporosis using a self-administered survey (FOOQ) on a convenience sample of 158 RNs completing their Baccalaureate in Nursing at the

University of Haifa and the Northern College in Israel. The aim of the study was to assess a variety of aspects related to nurses' knowledge and attitudes regarding OP. The authors found that nurses were positive about their role and their skills for OP management and believed they play an important role in educating the public in OP prevention and management. However as with studies by Ziccardi et al. (2004) and Amre et al. (2008), nurses' subjective and objective knowledge in different aspects of the disease such as risk factors, general knowledge of OP, signs and symptoms of OP and medications, was moderate. Knowledge regarding calcium and vitamin D as well as lifestyle was low. Regarding participants' beliefs about barriers for OP counselling, the participants identified barriers to osteoporosis counselling including: not part of the job; lack of time; more urgent issues; not confident about ability to counsel on behavioral change to reduce risk for OP; not believing patients would change their habits; and not being certain that nutrition and activity change would reduce the risk of OP.

In summary, these studies identified moderate to less than adequate knowledge regarding OP amongst health workers who play an important role in health promotion and prevention of disease. There are similarities amongst the various studies in regards to the areas of knowledge deficit and the mean score.

#### **2.4 Lay peoples' knowledge of osteoporosis**

A number of studies regarding lay women's knowledge of osteoporosis were found and chosen for this literature review for the purpose of comparing OP knowledge of health care workers with OP knowledge of lay persons.

In a descriptive study in the USA Ailinger and Emerson (1998) assessed knowledge of primarily young and/or post-menopausal women recruited from various work sites, primary care settings and a health fair. The Facts on Osteoporosis Quiz (FOOQ) was used to assess the women's knowledge on osteoporosis. The FOOQ is based on Orem's Self Care Theory and developed by Ailinger and Emerson (1998) to examine women's knowledge of OP. The average score on the FOOQ was 16 out of a possible 25, with a standard deviation (SD) of 4.87. The lowest number of correct answers related to the items on risk factors of calcium need in young women, alcohol abuse and high caffeine intake, populations at risk such as Asian-Americans and thin women, as well as the availability of treatment. There was no difference in the knowledge of women associated with age, education, menopausal status or family history of OP. This identified that a majority of women had inadequate knowledge of OP and its

associated risk factors and preventative behaviors. The study concluded that there was a need for nurses to educate women concerning the risk factors and prevention strategies.

A descriptive web-based study was conducted by Von Hurst and Wham (2007) amongst 622 women aged between 20 and 49 years living in Auckland, New Zealand. The purpose of the study was to investigate the knowledge and health beliefs of NZ women regarding osteoporosis risk factors. Two individual modified questionnaires were used, namely the Osteoporosis Knowledge Test (OKT) and the Osteoporosis Health Belief Scale (OHBS). This study revealed that younger women (aged 20-29) demonstrated the lowest level of knowledge, whilst older women (40-49) scored the highest. There was a weak correlation between OKT total scores and years of education. Beliefs in the benefits of exercise and calcium intake to prevent OP were strong across all ages. Older women were found to be more motivated to take care of their life than younger women. There was a low perceived personal susceptibility to OP in all age groups.

Spencer (2006) conducted a multi-centre, observational study regarding osteoporosis knowledge amongst 176 patients receiving bone density scans at a public hospital at two locations, the UK and Christchurch, NZ. The aim of the study was to assess the extent and source of OP knowledge in patients attending for DEXA scanning. The conclusion of the study was that OP knowledge was poor, with a large number of patients not knowing any risk factors, risk reducing measures or signs and symptoms. Only 15.3% of patients identified smoking, menopause and alcohol as risk factors. Measures to increase calcium levels were reported by 65.9% to be the best-known preventive measures. Of all the patients attending for the DEXA scan, only 50% had previously had a discussion with a health care professional regarding OP. The study concluded that knowledge of OP risk factors; preventive measures and signs or symptoms were poor. National campaigns to increase public awareness of OP were suggested.

Williams, Cullen, and Barlow (2002) conducted a cross-sectional study among a sample of women (n=165) in the United Kingdom. The purpose of this pilot study was to examine knowledge of OP, health behaviours, and health beliefs amongst women. The aims were to identify the gaps in the knowledge; assess the perceived risk of developing OP, determine the presence of risk factors; and gain insight in types of behavior that women pursue as preventative strategies. The belief is that women with

greater knowledge will feel more competent in their ability to engage in preventative health behaviours. The mean age of the women was 40 years. Data were collected by a self-administered questionnaire. The 13 item questionnaire assessed dimensions such as demographic data, health problems, lifestyle behaviours such as exercise, alcohol, smoking, and OP risk factors such as diet, medication, hysterectomy and other fractures. The study revealed a low perception of risk factors, or participants did not engage in risk behaviours. Of the 163 respondents, only 53% reported regular exercise. Regarding OP knowledge, 65% had never received information about OP. The mean level of OP knowledge was low (20.19, range 0-47). Knowledge regarding bone density scans, hormone replacement therapy, Vitamin D and specific exercises were poor. The study concluded that OP is a major public health problem, yet the focus of the intention remains on medical intervention at the point of fracture rather than on promotion of early preventive measures.

In contradiction with the last sentence, a few studies argued that there is a gap in addressing osteoporosis after the first fracture (Vaile et al., 2007). It is also believed that patients do not receive the recommended treatment for OP following a hip fracture (Petrella & Jones, 2006; Kamel, Hussain, Tariq, Perry, & Morley, 2000) or other fractures (Andrade et al., 2003). Also, health care providers are still significantly suboptimal in meeting OP screening recommendations (Sikon, Thacker, Carey, Deal, & Licata, 2006); and that older women with fractures are not screened and treated as per recommended guidelines for OP (Feldstein et al., 2003). Freedman, Kaplan, Bilker, Strom, and Lowe (2000) stated that current physician practices are inadequate for the diagnosis and treatment of OP in post-menopausal women who have sustained a distal radial fracture. Nguyen, Center, and Eisman (2004) concluded that OP is still under-rated, under-diagnosed and under-treated.

This lack of engagement was again identified by Giangregorio et al. (2010) who conducted a study involving OP knowledge among individuals who have suffered osteoporotic fractures. Giangregorio et al. used telephone interviews to evaluate OP knowledge and the factors associated with it. Participants included 738 men and women attending fracture clinics at two major teaching hospitals in Canada. Patients 40 years and older with fractures of the radius, humerus, femur, rib, tibia, pelvis, or vertebrae were included. The injury was considered to be an osteoporotic fracture if the fracture occurred due to minimal trauma. Interview questions included socio-demographic information, use of prescription medication in the year before the study, medical and fracture history and family history of osteoporosis. Patients were asked

about their understanding of what osteoporosis was. Unadjusted odds ratios were calculated to identify factors associated with a correct definition of OP. Predictors identified in uni-variate analysis were entered into multivariable logistic regression models. The odds of an individual providing a correct definition of OP were higher for those who reported a diagnosis of OP or those who reported higher education levels, but the odds decreased with increasing age. A subset of participants (39%) agreed to complete the FOOQ. The average score on the FOOQ was 13.6 out of a possible 21 correct responses, although 47% of respondents had a history of a prior fracture, 22 % had a family history of OP and 23% a diagnosis of OP. This indicates inadequate knowledge of OP in patients who have already sustained an osteoporotic fracture, especially regarding key OP risk factors, low body weight, excess alcohol intake, family history of OP, menopause and previous spine fracture.

Various studies summarized in the summary table (Table 1) revealed a number of commonalities regarding the gaps in knowledge of osteoporosis. Limitations in all of these studies are the small numbers of men in the research sample.

Comparing studies by Berarducci et al., (2002) and Ziccardi et al., (2004) involving nurses and studies involving lay public by Von Hurst and Wham (2007) and Williams et al. (2002) show there is no significant difference in the knowledge of OP between health care professionals and lay people. A systematic review by Werner (2005) was conducted to examine the status of research about osteoporosis regarding factors associated with knowledge and the relationship between knowledge about OP and participation in health-related behavior. Werner discovered that serious deficits in OP knowledge among healthy and diagnosed women and men, as well as among health care professionals have been reported. This highlighted the need to expand the research on knowledge about OP. Werner suggested that the term 'silent disease' not only refers to the fact that it is asymptomatic until a fracture occurs, but also refers to the scant attention OP received despite its serious physical and psycho-social consequences. Werner recommends that awareness of OP is raised by exploring the OP knowledge of health professionals involved in OP prevention and treatment as well as by those who suffer from the disease.

**Table 1: Summary Table for Knowledge of Osteoporosis**

Author/ Date	Purpose	Participants	Design/study /Method	Data-analysis method	Major findings
Hunt and Repa-Eschen (1998)	To answer a question regarding the importance of osteoporosis education and the topics that must be included in osteoporosis education	139 Registered Nurses working in acute, ambulatory and long-term care in America who joined the National Steering Committee of the National Osteoporosis Foundation in America	Non-experimental descriptive. A needs assessment questionnaire including demographic data, respondents' perceived need for osteoporosis education for patients and nurses, and respondents' knowledge of the need for education in 27 specific topics. A likert scale was used to rank the knowledge.	Descriptive statistics	Respondents expressed strong interest in and need for an educational program on osteoporosis. Knowledge of certain topics in osteoporosis was found to be less than adequate. Limitations: no random selection of subjects which could cause bias. Sample size too small to analyse subgroups
Berarducci, Lengacher, and Keller (2002)	To examine whether nurses have appropriate osteoporosis-related-knowledge necessary to provide osteoporosis prevention education for individuals throughout the lifespan	81 registered nurses attending a continuing education symposium on women's health agreed to participate. Only 63 (78%) completed both the pre- and post-test and was included in the study	Pre-test/ post-test, no control group, quasi-experimental .The Osteoporosis Knowledge Questionnaire (OKQ), a 22 item test with demographic data included on the pre-test. The questionnaire was validated with a content validity index of .955.	Descriptive statistics to assess demographic data of participants and osteoporosis related attitudes. A paired-sample <i>t</i> test was used to examine changes in osteoporosis knowledge including prevalence, risk factors, physical signs, preventative measures, diagnostic measures and treatment	The education program significantly increased the knowledge of osteoporosis. The results reinforce the need for osteoporosis – related continuing education to prevent disease.

Author/ Date	Purpose	Participants	Design/study /Method	Data-analysis method	Major findings
Berarducci (2004)	To explore the knowledge of OP at the end of a Baccalaureate program	95 senior nursing students at a university on the West Coast of Florida. Primarily female and white	Descriptive using a convenience sample, using a 22-item OPQ and a 7-item investigator-developed demographic questionnaire	Pearson product moment correlation  Descriptive statistics	Limited knowledge related to the magnitude of OP, risk factors associated with the disease, detection, treatment and preventive measures
Vered et al. (2007)	To assess a variety of aspects related to nurses' knowledge and attitudes regarding OP	A convenience sample of 158 RN's (84.4% female), mean age 39, completing a baccalaureate in nursing at 2 academic centres in Haifa, Israel	Self-administered survey using the FOOQ	Descriptive statistics	The average score was 17 out of a possible 24. Moderate knowledge on signs of the disease, medication and lifestyle. Low knowledge re calcium and Vitamin D. Recognised the role of bisphosphonates as treatment. Nurses believed they play an important role in educating the public. Identified barriers to osteoporosis counselling including not part of the job, lack of time, more urgent issues, not confident about ability to counsel on behavioural change to reduce risk for OP, don't believe patients will change their habits, not certain that nutrition and activity change will reduce the risk of OP.

<b>Author/ Date</b>	<b>Purpose</b>	<b>Participants</b>	<b>Design/study /Method</b>	<b>Data-analysis method</b>	<b>Major findings</b>
Amre et al. (2008)	To explore nursing students' knowledge of OP	4 <sup>th</sup> year Baccalaureate students at a university in Jordan. Included male (n=58) and female (n= 27) students aged between 19 and 32	Cross-sectional study using a 23-item knowledge questionnaire as per Berarducci et al. (2004) and Ziccardi et al. (2004)	SPSS 12 for descriptive analysis	As opposed to the study by Ziccardi, this study identified a lack of knowledge amongst final year students, specifically about when bone loss starts, definition of OP, signs of OP, especially loss of height, RDI of calcium and pathophysiology. The authors concluded that graduating nursing students have limited knowledge to undertake the role of health promotion and disease prevention in the community.
Ailinger and Emerson (1998)	To examine women's knowledge of OP risk factors and preventive behavior.	247 women at various work sites, primary health care setting and a health fair	Descriptive study using the 25-item FOOQ.	Descriptive statistics	Average score was 16 out of 25. Lowest score was on risk factors, e.g. calcium need in young women, alcohol abuse and high caffeine intake, population at risk and availability of treatment. Majority of women had inadequate knowledge of OP and its risk factors and preventive behaviors.

<b>Author/ Date</b>	<b>Purpose</b>	<b>Participants</b>	<b>Design/study /Method</b>	<b>Data-analysis method</b>	<b>Major findings</b>
Von Hurst and Wham (2006)	To investigate the knowledge and health beliefs regarding risk factors of New Zealand women	Well- educated NZ women aged 20-49 living in Auckland	Descriptive web-based survey using 2 questionnaires namely OKT and OHBS	Normal Q-Q plots and de-trended Q-Q plots. Non-parametric tests. Uni-variate linear regression analysis for attitude and knowledge	Moderate knowledge with 16.4 out of 26. Younger women (20-29) lower knowledge than older (40-49). Perceived susceptibility low with 2/3 not considering themselves susceptible to OP. All ages demonstrated belief in the benefits of exercise and calcium intake to prevent OP; Re health motivation, older women were more highly motivated to take care of health than younger women.
Spencer (2006)	To assess the extent and source of OP knowledge	176 Patients (male n = 26; female n = 149; 1 unknown) aged 22-85 attending DEXA scanning at 2 centres: one in UK and one in Christchurch, NZ	Multi-centre observational study using a questionnaire	Descriptive statistics	Overall knowledge was poor. Most commonly suggested risk was lack of calcium (42.6%), followed by lack of exercise, family history and smoking. 32.4% were unable to suggest any risk factor. !9.3% could not suggest any risk-reducing measure. A fracture was suggested as a sign of OP by most (43.2%). 48.9% had a previous discussion with their doctor about OP

## **2.5 Studies regarding the importance of osteoporosis prevention**

According to Berarducci (2004a) osteoporosis can be prevented through modification of unhealthy lifestyle behaviors such as adequate calcium intake, adequate vitamin D attainable through sun exposure or supplements, weight-bearing exercises and refraining from smoking and excessive alcohol intake. However, it is evident that osteoporosis is not usually managed until the disease becomes evident (Whitehead et al., 2004).

Sedlak, Doheny, and Jones (2000) presented a study to describe the implementation and evaluation of three different osteoporosis prevention education programs. The purpose was to increase knowledge of OP, assess health beliefs, and to increase the frequency of OP preventing behaviors using adult learning theory and the Health Belief Model developed by Rosenstock in 1966. The goal was to describe the type of program that would change knowledge, health beliefs and behaviors for women depending on their needs and backgrounds about OP risk factors. The participants were all Caucasian women, with age and knowledge the factors influencing their readiness for learning, their learning needs and the intensity (namely intense, intermediate or brief) of the program. Those in the brief program were nurses. The program evaluation methods included the Osteoporosis Knowledge Test (OKT), Osteoporosis Health Belief Scale (OHBS) and the Osteoporosis Preventing Behaviour Survey (OPBS). Related to the impact of educational programs on knowledge, all three educational programs had significantly higher levels of knowledge at post-test than at pretest. All the programs increased participants' knowledge of OP prevention regardless of the design. However none of the programs changed the participants' health beliefs about OP nor did it increase their prevention behaviours.

Berarducci, Burns, Lengacher, and Sellers (2000) conducted a descriptive survey in Florida, USA of primary care providers (PCPs) actively engaged in internal medicine, adult health, gynecology and family practice. The purpose of the study was to determine what routine osteoporosis-related education was provided to women aged 49 years and younger and women 50 years and older. Specific questions included the frequency of OP risk assessments, diet histories, exercise patterns, smoking and alcohol consumption, provision of information re OP; what educational strategies re OP prevention most frequently used; and different strategies used for age, sex, or provider level of PCP. The Osteoporosis Health Education Survey (OHES), a validated 21-item, self-report questionnaire, was developed and used for this study. The items measured subjects' self-reporting of OP educational practices related to risk management, diet history, smoking, alcohol intake, exercise habits, delivery of OP preventive education,

and OP health-promoting education. Paired sample t-tests indicated significant differences in the frequency of OP risk assessment done for women  $\leq 49$  years and women  $\geq 50$  years old. OP risk, diet histories and exercise pattern assessments are more frequently performed on women 50 and older. There were no significant differences in frequency of assessing alcohol consumption and smoking habits. The most frequent used method for providing OP-related education is one-on one interaction, followed by printed information.

Lack of perceived susceptibility may influence prevention strategies. With the prevalence of OP and its associated morbidity and mortality, increased awareness and the adoption of preventive behaviours are important (Brecher, Pomerantz, Snyder, Janora, Klotzbach-Shimomura, & Cavalieri, 2002). Brecher et al. conducted a study of 11 women aged 25 to 75 years in New Jersey, USA. The purpose of the study was to evaluate the effectiveness of a brief (3 hour) multidisciplinary interactive primary OP prevention program (OPP) for community-dwelling women. The researchers hypothesized that women who participated in the OPP would increase their knowledge about OP and increase calcium intake and exercise when compared with women who did not participate in the OPP. Perceived susceptibility to OP, willingness to adopt lifestyle changes in calcium intake and exercise, and perception of ability to make lifestyle changes were also evaluated. The second hypothesis was that older women who participated in the program would increase knowledge and exercises more than younger women because they would feel more susceptible and therefore more likely to change behaviors. The women were randomly assigned to either a treatment group, who received the educational intervention, or to a control group, who first completed a posttest and follow-up questionnaires and then received the intervention. Unpaired, two-tailed *t*-tests and  $\chi^2$  analysis were used to compare the baseline performance of the groups. Findings suggested there were no significant differences between treatment and control groups on knowledge about OP, intent to change calcium intake and exercise, current exercise, dietary calcium intake, beliefs about OP and exercise, perceived susceptibility, and self-efficacy. Results showed intervention participants were more likely to plan to change their calcium intake at posttest in comparison to the control group, although the majority of both groups reported changing their calcium intake. There were no significant differences for exercise intentions at any of the three time frames used in the study. The study concluded that the findings provided evidence that the OPP was effective in educating women about OP, that there is a critical need to emphasize the importance of primary prevention and that due to the lack of

symptoms, in early OP, the disease is often under-appreciated, and thus affected individuals were under-treated.

Using the OHBS Johnson, McLeod, Kennedy, & McLeod (2008) conducted a cross-sectional study among 300 participants of various age groups and genders to compare osteoporosis health beliefs. The study compared the participants' perceived susceptibility amongst different age groups and concluded that there were significant differences in susceptibility scores amongst different age and gender groups. More specifically, in both gender groups perceived susceptibility were lower in the young adult (18-25) group than in the two older (30-50 and 50-plus) age groups. Compared to men women had significantly higher susceptibility scores. Johnson et al. highlighted the need for osteoporosis awareness programs that targeted different aspects of belief perceptions specifically for younger women and men.

Also using the OHBS Piehowski, Nickols-Richardson, Clymer, & Roberto (2010) examined the differences in osteoporosis health beliefs and practices between pre-and post-menopausal women across four age cohorts. The OHBS were completed by 203 women aged 26-86. The study concluded that pre-menopausal women perceived osteoporosis as more serious compared to post-menopausal women. Piehowski et al. suggest that women may be motivated to engage in osteoporosis prevention practices depending on age. Pre-menopausal women engage osteoporosis preventive behavior because they view osteoporosis as a serious disease. Post-menopausal women engage in preventive behaviours due to internal health motivation and perception of osteoporosis prevention benefits. Piehowski et al. suggest the effectiveness of osteoporosis health beliefs in determining priorities for osteoporosis strategies and educational interventions tailored for women of all ages.

Radziunas (2006) described the significance of the role of the nurse in the prevention, detection and management of osteoporosis as part of the nature and scope of the nursing profession, an aspect supported by the Nursing Council of New Zealand scope of practice for registered nurses (Nursing Council of New Zealand [NCNZ], 2010a). Radziunas emphasized enhanced knowledge within the nursing curriculum and ongoing professional development. The need to acknowledge the prominence of osteoporosis amongst other chronic illnesses such as cardiovascular disease and diabetes was also identified.

Rouhe (2008) identified measures to close the large gap in osteoporosis education in the orthopaedic setting and suggested the role of the nurse health educator to bridge the gap. Rouhe identified and discussed various education barriers such as lack of

physician awareness and patient's osteoporosis perception, beliefs, medication, and treatment compliance. Rouhe emphasized the role orthopaedic nurses play due to the knowledge they have and as part of their scope of practice. Rouhe suggested various methods of educating patients on osteoporosis, starting with a simple program of increasing awareness of calcium and vitamin D intake, daily exercises and lifestyle modifications. Nurses should also be offering patients risk assessment and screening for osteoporosis.

## **2.6 Questionnaires used to assess osteoporosis knowledge**

A number of questionnaires to test osteoporosis knowledge have been developed. Most studies discussed in the literature review of this study included a questionnaire about knowledge, perceptions, attitudes and awareness of osteoporosis, targeting nurses, nursing students, public health nurses, and other health care professionals as well as lay people. The questionnaires were either newly designed and tested for the purpose (Chen et al., 2005; Olayinka et al., 2007; Skedros, Holyoak & Pitts, 2006), existing questionnaires regarding osteoporosis knowledge, namely the Osteoporosis Knowledge Questionnaire (OKQ) designed by Berarducci et al. (2002); and the Facts on Osteoporosis Quiz (FOOQ) designed by Ailinger and Emerson (1998); or modified using existing questionnaires regarding osteoporosis knowledge (Amre et al., 2007).

A systematic review by Werner (2005) examined the status of research about osteoporosis by reviewing and analysing literature as it pertained to assessment of knowledge including both health workers and lay people about osteoporosis, factors associated with knowledge, and relationship between knowledge about osteoporosis and participation in health-related behaviors. Werner critically analysed the theoretical base of all the questionnaires used in the various studies regarding osteoporosis knowledge, which include amongst others the questionnaire used by the studies included in the literature review such as The Osteoporosis Knowledge Questionnaire by Berarducci et al. (2002) and the Facts on Osteoporosis Quiz by Ailinger and Emerson (1998). Werner suggested that the majority of instruments reviewed were characterized by a lack of theoretical foundation, including the OKQ used by Berarducci et al. and that the only instrument explicitly based on a conceptual framework is the FOOQ used by Hannon & Murphy (2007) and Vered et al. (2008).

### 2.6.1 Fact on Osteoporosis Quiz (FOOQ)

The FOOQ was developed by Ailinger and Emerson (1998) and based on Orem's self-care theory. The objectives guiding the development were assessment of the knowledge of facts about osteoporosis, the recognition of preventive behaviors for osteoporosis and the identification of major risk factors associated with osteoporosis. The FOOQ can be used as a screening tool in osteoporosis health promotion or disease management programs and by lay woman as a self-care knowledge quiz. The format of the quiz is true/false/don't know format which was tested and validated using an expert panel, a convenience sample of nursing and non-nursing students and a community group.

This questionnaire was used by Vered et al. (2008) with registered nurses. Vered's study added sections regarding beliefs about barriers for osteoporosis counseling, attitudes regarding the nurses' role in the management of the disease and nurses' practice concerning osteoporosis. The results of Vered's study provide a benchmark for comparison for this study, although answers were restricted by a few given options and assessed via a Likert scale as opposed to own interpretation in this study.

### 2.6.2 The Osteoporosis Knowledge Questionnaire

The OKQ is a 22-item, multi-choice instrument designed to measure knowledge of osteoporosis and preventive measures amongst nurses. It includes three categories including general knowledge of osteoporosis such as epidemiology and prevalence; pathophysiology such as disease manifestations and treatment; and preventive behaviors such as non-pharmacological treatments (Berarducci et al., 2002 and Berarducci, 2004). The OKQ focuses on pathophysiology and risk factors and asks more specific factual questions pertaining to nurses (Brown, 2004). To assess content validity the questionnaire was evaluated by seven osteoporosis experts, resulting in a content validity index of 0.955 for the entire instrument (Berarducci, 2004). Supporting this, Giangregorio et al. (2007) also found the OKQ demonstrated content validity ( $r = .95$ ). In selecting an osteoporosis questionnaire for the study conducted amongst health care professionals working with patients who have experienced or are at risk of fracture, Giangregorio et al. found that no other available questionnaire have been validated in a broader spectrum of healthcare providers. In regards to reliability, Pearson product moment correlation was used to assess reliability using test/retest method for a 2 week period. The Pearson product moment correlation was .77, indicating stability of the instrument over time (Berarducci, 2004). Therefore the OKQ was selected for this study.

### 2.6.3 Reliability and validity

Data collected via a questionnaire should be valid and reliable (Parahoo, 2008). Before using an instrument it should be scrutinized for reliability and validity which indicate the extent to which an error is present in an instrument. Reliability focuses on the consistency, stability and repeatability of a data collection instrument (Salmond, 2008). It refers to the accuracy and consistency of information obtained in a study (Polit & Beck, 2008) as well as the consistency in which participants of similar characteristics and outlook understand and respond to the questions (Parahoo, 2008). Statistical reliability is the probability that the same results would be obtained with a completely new sample of subjects (Polit & Beck, 2008). For the purpose of this study, results will be compared to that of previous studies conducted by Berarducci (2004) and Giangregorio (2007).

Validity is the extent to which an instrument measures what it says it measures (Salmond, 2008) in regards to the study's objectives (Parahoo, 2008). Parahoo suggests piloting a questionnaire amongst peers could enhance validity and reliability. As the OPQ has been used in previous studies and has been previously validated, there was no need to pilot the questionnaire before submitting it to potential participants in this study.

## 2.7 Summary

It has been identified that OP is a highly prevalent yet preventable and treatable disease affecting millions of people all over the world. Nurses are valuable resources for health promotion and prevention of OP. Nevertheless, knowledge of OP amongst lay people and health care professionals is inadequate. Research suggests the majority of nurses as health promoters and educators do not have sufficient knowledge to educate lay public about modifiable risk factors as well as treatment options available. Although the studies ranged over more than a decade, the outcomes remained approximately the same, indicating a lack of progress in the prevention of OP as a disease, and a lack of implementation of the recommendations to increase nurses' knowledge of OP. With the substantial amount of information available about osteoporosis, it is surprising that knowledge of osteoporosis amongst both health care professionals and lay people are too insufficient to prevent the disease or to reduce the burden of the disease. With the ageing population and the predicted increase of osteoporosis by the WHO (2003) and ONZ (2007a), the lack of knowledge of osteoporosis is of grave concern. Huge gaps in the diagnosis and treatment of patients after the first fracture have also been identified. Nurses play an important role in the prevention of disease. However, in exploring the role of nurses in the prevention of

osteoporosis, Whitehead, Keast, Montgomery, and Hayman (2004) found limited evidence that existing osteoporosis services have been led, measured or evaluated by nurses and where osteoporosis intervention is driven by doctors, it is not dealt with effectively.

Studies regarding nurses' knowledge of OP are all overseas studies. Studies including nurses working with orthopaedic patients who sustained osteoporotic fractures were limited. The literature review identified a need to establish what nurses in New Zealand, particularly orthopaedic nurses, know about OP and how they perceive their role in the prevention and management of the disease. The need for continuing education and increased awareness of nurses in OP knowledge has been strongly suggested as the key to the prevention and early detection and management of osteoporosis.

## CHAPTER THREE

### METHODOLOGY

#### 3.1 Introduction

Methodology refers to the framework for conducting a study (Schneider et al., 2008). In determining the research approach for this study, a range of quantitative and qualitative research methodologies were explored. This chapter outlines the design and methods of this study. A justification for the use of the descriptive explorative approach used to answer the research question in this study will be included in this chapter.

#### 3.2 Theoretical overview that formed the basis of this research

As stated by Polit and Beck (2010) the relationship between theory and research is reciprocal, with theory guiding and generating ideas for research and research assessing the worth of the theory and providing the foundation for new theories. Nursing research needs to be conducted within a proper framework, however not every study is based on a theoretical or conceptual model (Polit & Beck, 2010), such as where studies are unique or exploring either unknown or previously unexplored domains (Schneider et al., 2008) such as descriptive and explorative studies. For these studies a conceptual framework can be used (Borbasi, Hengstberger-Sims, & Jackson, 2008)

Nursing theories that attempt to describe and explain the practice of nursing are developed and constantly tested by nursing researchers (Borbasi et al., 2008). Theories serve to explain research findings in an orderly fashion by guiding the researcher's understanding of the 'what' of a natural phenomenon and the 'why' of its occurrence, therefore giving both direction and impetus (Polit & Beck, 2010). Theoretical research frameworks are underpinned by known and tested theories whereas conceptual frameworks relate to multiple-related but untested concepts (Schneider et al., 2008), yet providing a broad, loosely structured conceptual perspective regarding interrelated phenomena (Polit & Beck, 2010).

Research activities are broadly divided into two paradigms (qualitative and quantitative) that guide the direction of conducted research with further delineation in a common classification of research paradigms such as positivist (quantitative), critical (qualitative) and interpretive (qualitative) (Schneider et al., 2008). When selecting an appropriate method to conduct research factors such as the researchers' philosophy and world view and the research question have to be taken into consideration (Polit & Beck,

2010). The researcher's world view is set out in a conceptual framework which determines the overall research approach (Lacey, 2010). Other factors include the purpose of the study, the nature of the problem being investigated, and whether or not the study needs to be generalised.

Philosophically quantitative research is driven by positivism which proposes scientific truths and laws (Topping, 2010). Within the positivist (quantitative) paradigm researchers seek to be objective, involving orderly, disciplined procedures with tight controls over the research situation to test the nature of a phenomena and the relationships within (Polit & Beck, 2010). Few researchers follow the principles of pure positivism due to its strict positive thinking. This gave rise to the post-positivist paradigm which recognises the impossibility of total objectivity and the seeking of probalistic evidence (Polit & Beck, 2010).

Within the naturalistic paradigm (qualitative), a countermovement to positivism and an alternative to disciplined research, reality is not a fixed entity but a construction of the individuals' participation in the research, often in close contact with the researcher (Polit & Beck, 2010). The two paradigms will be explored further in context to the current study.

### **3.3 Research method**

#### **3.3.1 Research perspective for this study**

The golden rule for any study method is that it should be suitable for the problem under investigation (Watson & Keady, 2008) and based on the research question and the purpose of the study (Schneider et al., 2008). In identifying the topic and the question for this research, conclusions drawn from the literature review were that nurses' knowledge of osteoporosis was at the same level as that of lay people. It was also not clear how nurses perceive their role in the prevention of osteoporosis. For nurses to play a role in the prevention of disease, their knowledge needs to be superior to that of their clients. Due to orthopaedic nurses' involvement with patients with musculoskeletal problems, the assumption is that they should have the appropriate knowledge about diseases that affect the musculoskeletal system.

For the purpose of this study it was not possible to choose a single paradigm to answer the question as a pure positivist approach would not fulfil the research purpose. It is acknowledged in research that adherence to a single research approach or method might be inadequate when it comes to answering a research question (Schneider et al., 2008).

To explore and measure the variables of interest, namely the participants' knowledge of osteoporosis and their perception of their role in the diagnosis, treatment and education of patients presenting with a suspected osteoporotic fracture, a predominantly quantitative descriptive exploratory study approach has been chosen to assess participants' knowledge of OP. This was supported by a qualitative approach to investigate participants' perceptions of their role and identification of barriers to OP prevention. The data collection method chosen was a self-administered web-based questionnaire.

### 3.3.2 Quantitative research

From a positivist perspective this study aimed to gather information regarding knowledge of osteoporosis from a convenience sample of orthopaedic nurses affiliated with the New Zealand Orthopaedic Nurses Association in order to generalise the findings to all nurses in New Zealand. Quantitative research, based within the positivist paradigm (Topping, 2010) is used to describe, explore, explain or predict observable and measurable conditions with as much objectivity as possible (Borbasi et al., 2008).

### 3.3.3 Qualitative research

To understand nurses' perception of their role in the prevention, education, diagnosis and treatment of osteoporosis, a qualitative approach was included in the study. Qualitative research is more symbolic and conceptual than quantitative research and adopts an interpretist and naturalistic approach to investigate phenomena, such as attitudes, beliefs, meanings, values and experience of research participants (Schneider et al., 2008). As stated by Procter, Allen, and Lacey (2010) qualitative research increases knowledge and understanding about features of the target population under study.

### 3.3.4 Data collection method and selection of the questionnaire

Data collection for this study was by a three part questionnaire. Part one consisted of closed-ended questions regarding demographic data and educational background including additional post-graduate study, position, years of experience, and personal history about osteoporosis. In order to benchmark orthopaedic nurses of New Zealand knowledge of osteoporosis in part two, it was important to select a questionnaire used in other studies. A questionnaire designed by Berarducci et al. (2002), the Osteoporosis Knowledge Questionnaire (OKQ), has been slightly modified by adding a question to adapt the questionnaire to the New Zealand population. Open-ended questions regarding orthopaedic nurses' perceptions of their role in the prevention, diagnosis, treatment and education of OP has been included in part 3. The self-

administered, web-based questionnaire was managed by SurveyMonkey™. The survey was conducted between the 1<sup>st</sup> of September and the 3<sup>rd</sup> of October 2010.

### **3.4 Sampling**

#### **3.4.1 Sampling method and size**

For the purpose of this study convenience sampling, including snowball sampling was chosen as it fits both the quantitative and qualitative part of the research. Access to members of the New Zealand Orthopaedic Nurses Association (NZONA) was gained through the secretary of NZONA.

The link for the web-based questionnaire, including a brochure with information regarding the study, was sent by email to 55 members of NZONA and 15 local nurses working on the orthopaedic ward with a request to extend the invitation to colleagues who fit the criteria. The information sheet included information regarding the purpose of the study; timeframe, instructions for completing the questionnaire and the rights of the participants. A hundred fliers inviting orthopaedic nurses to participate in the study were hand-delivered at a recent orthopaedic nurses' conference in Wellington. Contact persons at four other hospitals were contacted and agreed to send the link and brochure by email to colleagues who fit the criteria. Reminders were sent out three weeks and one week before the final day of the study.

#### **3.4.2 Inclusion Criteria**

Nurses working in orthopaedic units or orthopaedic outpatient departments in New Zealand hospitals were the target population of this study. The inclusion criteria were Registered Nurses with more than one year experience working with orthopaedic patients. Members of the New Zealand Orthopaedic Nurses Association (NZONA) were targeted with the purpose of including participants from various geographical areas within New Zealand.

#### **3.4.3 Potential benefits and risks**

Findings from this study could aid in increasing orthopaedic nurses' awareness of osteoporosis which could help decrease osteoporosis and fracture risk. It could also highlight strategies to improve knowledge of osteoporosis.

### **3.5 Data analysis**

Both quantitative and qualitative analysis approaches were needed to analyse the data in this study. For quantitative data analysis Microsoft Excel was used. Demographic data were analysed and the scores on the OKQ were presented as means and

standard deviations. Only one correct answer per question was allowed with a possible total score between 0-23 for the OKQ.

To reflect on frequently reported patterns in participant's response to the open-ended questions, an inductive approach was used (Thomas, 2003) for the qualitative data analysis. In explaining the key features of the general inductive approach, Thomas defines it as a systematic procedure for analysing qualitative data where the analysis is guided by specific objectives. It is used to condense extensive and varied raw data into a brief, summary format (Thomas, 2003). Themes and categories were established from responses to the questions regarding nurses' perceived roles, the barriers in prevention education and the choice of educational material. As stated by Gerrish & Lacey (2010), all the forms of analysis refer to the development of themes and categories as related to the analytical method. Themes will therefore be descriptively grouped according to similarity.

### **3.6 Ethical considerations**

This research conforms to ethical requirements. The principles of informed consent, privacy, confidentiality and anonymity were applied in this study.

#### **3.6.1 Approval process**

Ethical approval for this study was sought and obtained from the New Zealand Multi-Region Ethics Committee and the Eastern Institute of Technology Research Ethics and Approvals Committee.

#### **3.6.2 Informed consent**

The APA Ethics Code (2002) states that researchers may dispense with informed consent where anonymous questionnaires are used. With voluntary participation, completing the questionnaire is regarded as consent.

#### **3.6.3 Anonymity**

It was not possible to identify any individual respondent from the data provided by SurveyMonkey™, thus anonymity was ensured. Participants were not identifiable in any reports or conclusions of the research.

#### **3.6.4 Cultural consideration**

Although the study does not particularly target Maori, some participants may be of Maori descent. Discussions were held with the Maori Health Advisor at TDH in regards to the cultural sensitivity and appropriateness of the questionnaire and approval gained. Confirmation was given that no comparison between knowledge of Maori nurses and that of other participants would be drawn.

### 3.6.5 Potential conflict of interest and roles

Although I work in a position of power with some of the participants, no coercion was involved. Participants received an invitation to participate in the research via email. Voluntary participation and anonymity were emphasised.

## 3.7 Summary

In this chapter the methodology for this research was discussed including aspects of the sampling process and data collection method. The methods for analysing the data were outlined. Chapter 4 outlines the results of the study.

## CHAPTER FOUR

### RESULTS

#### 4.1 Introduction

This chapter provides the results of the study. There were 41 respondents to the survey, with 41 completing the demographic section, 38 completing the OKQ and 29 the open-ended questions.

#### 4.2 Socio-demographic, professional and health characteristics

Forty one female nurses completed this part of the questionnaire. Responses were analysed and will be discussed in this section.

##### 4.2.1 Initial registration

Participants were given three categories of registration to select from including Registered General and Obstetric Nurse (RGON), Registered Nurse (RN) and Registered Comprehensive Nurse (RCPN). "Other" was included but not selected by any participants. Responses are displayed in Figure 1.

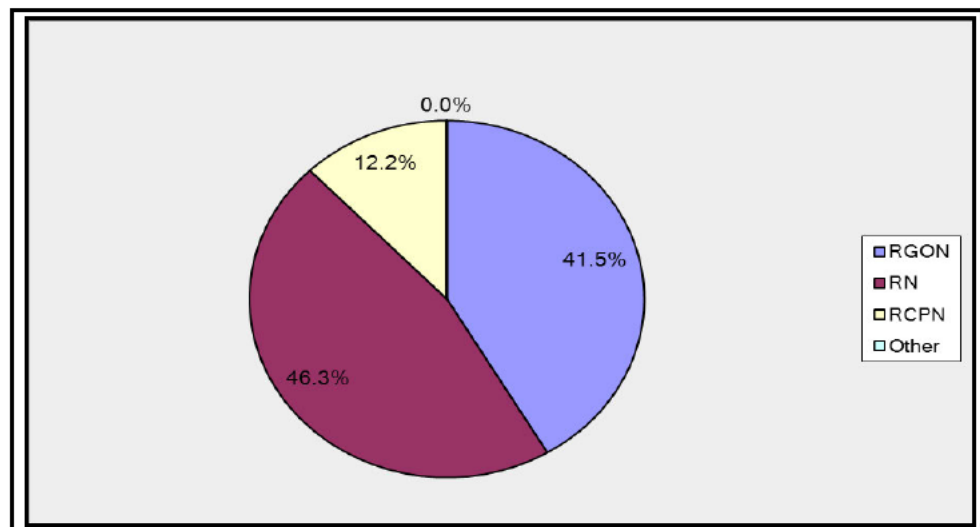


Figure 1: Initial Registration

##### 4.2.2 Qualifications

Participants were given six qualification categories including "other" to choose from. More than one option could be selected. The highest level of education was Master of Nursing, Master of Arts and a Master of Clinical Education. Nine participants held a post-graduate diploma, 10 held a post-graduate certificate and 15 participants a bachelor of nursing. Four nurses (9.8%) had formal training in orthopaedic-related diseases. "Other" was selected by 8 participants and included two master degrees and

a bachelor of nursing obtained overseas, no formal qualification, diploma in applied science nursing, a certification in education, a school certificate, and a diploma in nursing. Responses are displayed in Figure 2.

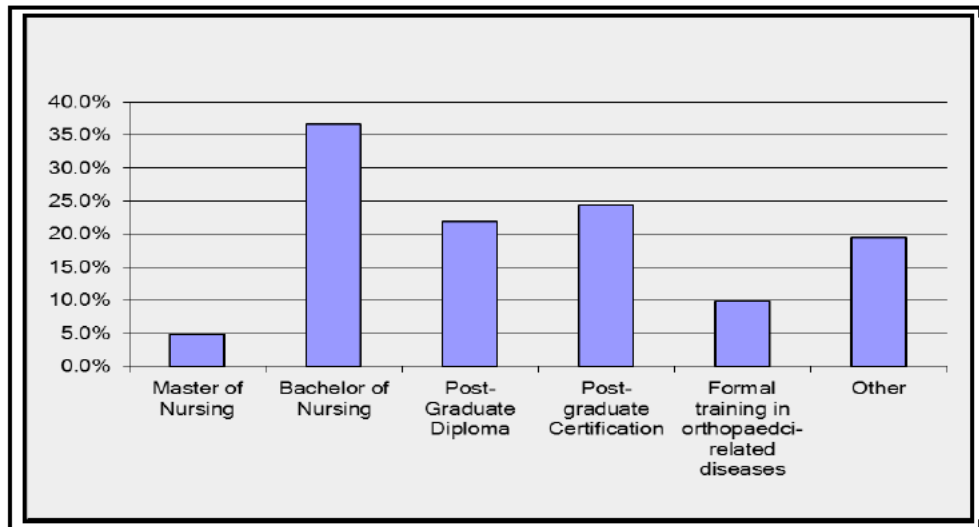


Figure 2: Qualifications

#### 4.2.3 Years post-graduate experience

To ensure participants had opportunity to gain knowledge of orthopaedic nursing, more than one years' post-graduate experience in working with orthopaedic patients was the inclusion criteria. As demonstrated in Figure 3 the majority of participants, (51.2%, n = 21) had more than ten years' experience working in orthopaedics.

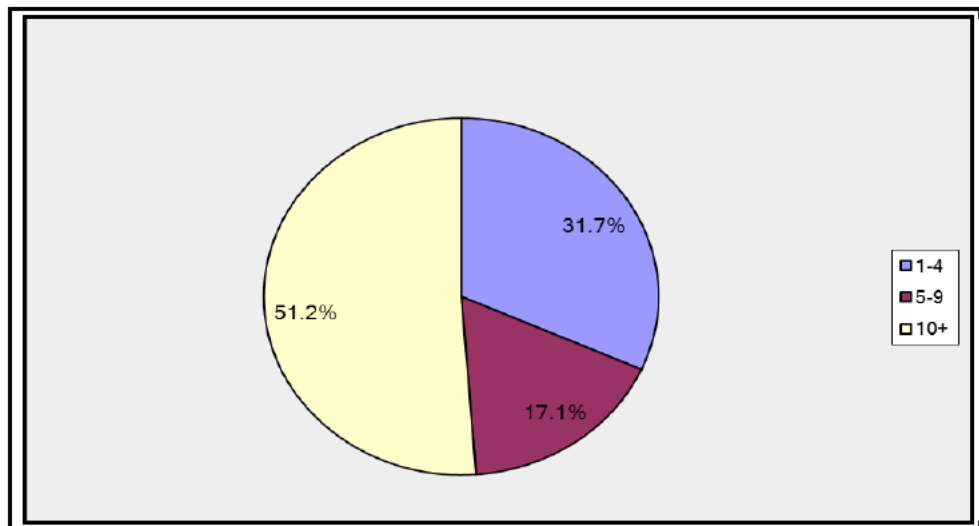


Figure 3: Years post-graduate experience in orthopaedics

#### 4.2.4 Age of participants

The majority of participants were over the age of 50, followed by the age range of 41 to 50 years as reflected in Figure 4.



**Figure 4: Age of participants**

#### 4.2.5 Ethnicity

Participants were asked to identify their ethnicity as New Zealand Maori, Cook Island Maori, Pacific Island, NZ European/Pakeha, other European or “other”. The participants were mainly of New Zealand European descent (63.4%, n = 26). The remaining participants were other European (17.1%, n = 7), New Zealand Maori (12.2%, n = 5) and other (7.3%, n = 3) which included Philippine, Indian and unspecified. Cook Island Maori and Pacific Island were not represented in the sample.

#### 4.2.6 Facility and Area of practice

The participants worked mainly in a tertiary District Health Board (DHB) (51.2%, n = 21), followed by secondary DHB (39%, n = 16), and private hospital (7.3% n = 3). All participants apart from one are currently practicing in the field of orthopaedic nursing. The area of practice is displayed in Figure 5.

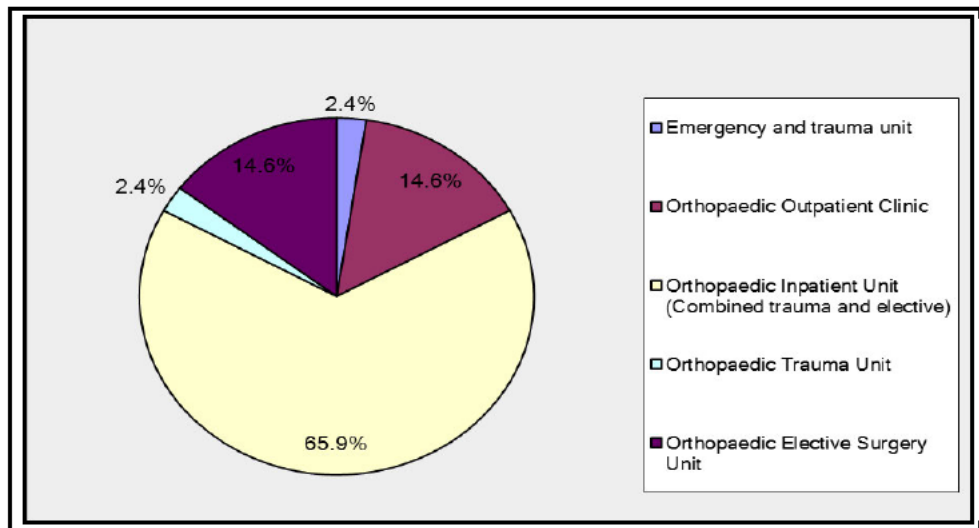


Figure 5: Area of practice

#### 4.2.7 History of osteoporosis

No family history of osteoporosis was reported by 71.05% (n = 27) while 13.15% (n = 5) responded with a “yes” and 15.78% (n = 6) responded “don’t know” to family history (Table 2).

Table 2: Family history of osteoporosis

Family history of osteoporosis			
	Yes	No	Don't know
Age 50+ (n=21)	2	17	2
Age 41 - 50 (n = 9)	1	7	1
Age 31 - 40 (n = 6)	2	2	2
Age 20 - 30 (n = 2)		1	1
<b>Total (n=38)</b>	<b>5</b>	<b>27</b>	<b>6</b>

The majority of respondents reported no personal history of osteoporosis (Figure 6).

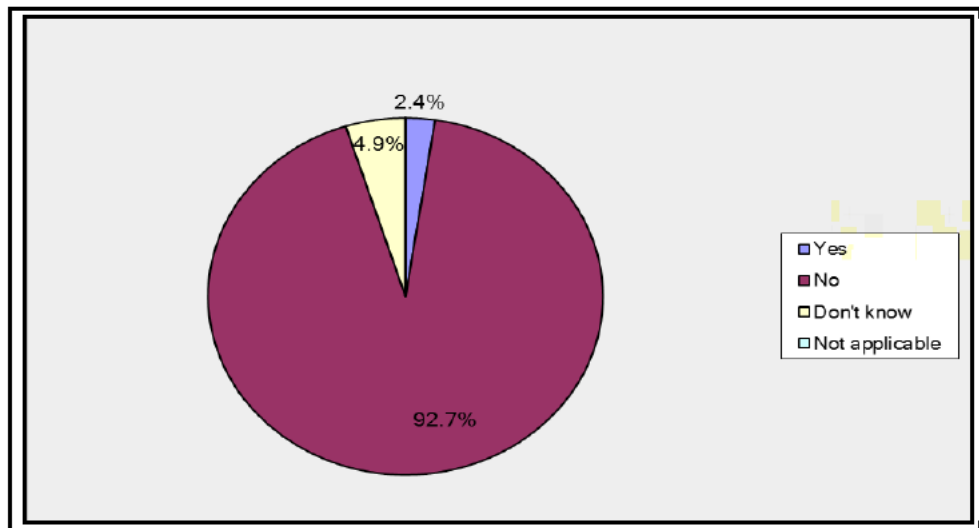


Figure 6: Personal history of osteoporosis

### 4.3 Responses to the Osteoporosis Knowledge Questionnaire

Thirty eight participants completed this part of the questionnaire. Out of a total of twenty three possible correct answers, the average score was 14.78 (64.29%), with scores ranging from eight to twenty (34.78% – 86.95%). The modified version of the Osteoporosis Knowledge Questionnaire (Berarducci, 2002) consists of three categories including general knowledge, pathophysiology and prevention.

#### 4.3.1 General knowledge category

There were five questions in the general knowledge category. Table 3 identifies the questions in this category.

Table 3: Questions in the general knowledge category

Q1	What percentage of New Zealand women over the age of 50 will develop osteoporosis?
Q8	Osteoporosis literally means
Q19	Which of the following statements is not correct?
Q20	Once a woman begins to lose bone mass:
Q23	True or false: NZ Maori has a higher incidence of Osteoporosis than Pakeha.

Responses to question one regarding the percentage of New Zealand women over the age of 50 that will develop osteoporosis had a mixed response as demonstrated in Figure 7. Only 31.6% participants correctly selected the 50% option.

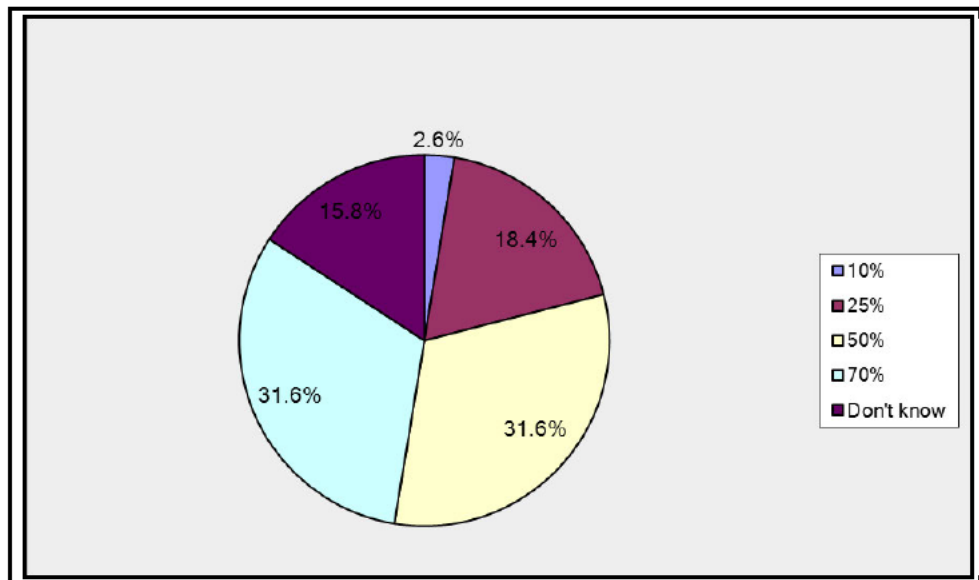


Figure 7: What percentage of New Zealand women over the age of 50 will develop osteoporosis?

In question 8 participants had to identify the meaning of the word “osteoporosis”. All but one participant correctly selected “porous bones” as the answer.

In question 19 participants had to select the incorrect statement about facts of osteoporosis. Choosing the incorrect fact on osteoporosis, namely that decreasing bone mass is part of the normal aging process had a mixed response, as demonstrated in Figure 8.

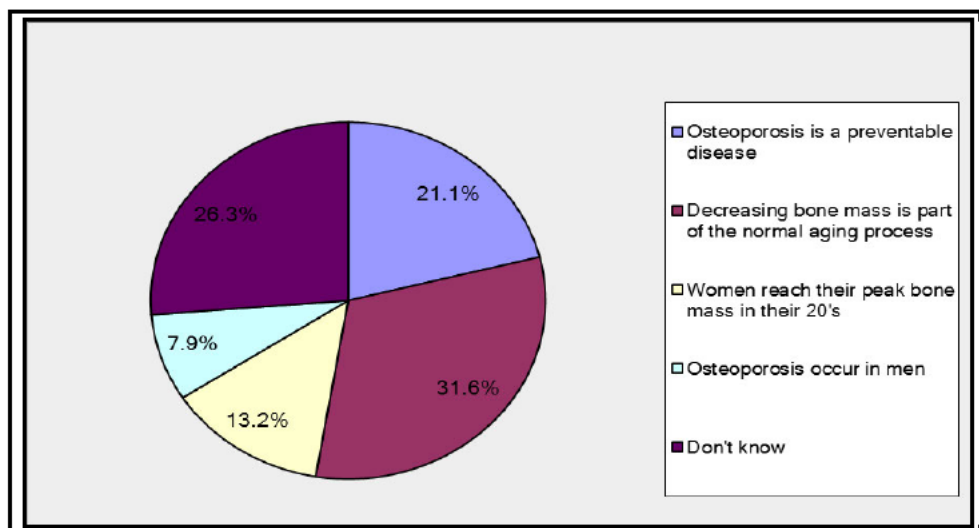


Figure 8: Which of the following statements is not correct?

Question 23 was added to tailor the questionnaire for New Zealand. Participants were asked to identify whether osteoporosis had a higher incidence amongst Maori than Pakeha. Responses to the question are demonstrated in Figure 9.

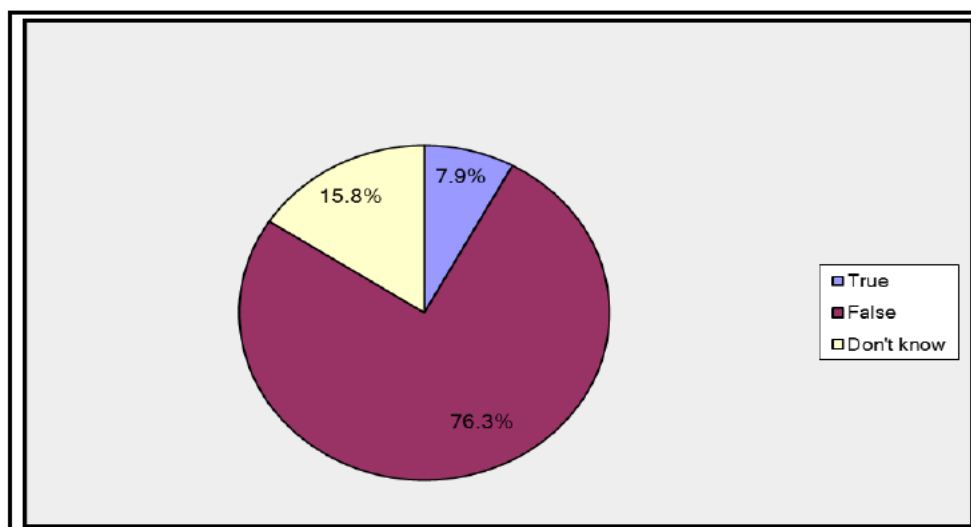


Figure 9: True or false: NZ Maori has a higher incidence of osteoporosis than Pakeha

In the general knowledge category the number of correct responses varied between 31.6 % and 97.4%, with an average of 66.86% as demonstrated in Table 4. The average incorrect responses were 21.52% and the average “don’t know” responses 11.58%, demonstrating a higher level of knowledge in this category.

Table 4: Responses general category

Questions	Correct responses		Incorrect response		Don't know	
	%	n	%	n	%	n
Q 1 What percentage of New Zealand women over the age of 50 will develop osteoporosis?	31.6	12	52.6	20	15.8	6
Q 8 Osteoporosis literally means	97.4	37	2.6	1		
Q19 Which of the following statements is not correct?	31.6	12	42	16	26.3	10
Q20 Once a woman begins to lose bone mass:	97.4	37	2.6	1		
Q.23 True or false: NZ Maori has a higher incidence of Osteoporosis than Pakeha.	76.3	29	7.8	3	15.8	6
<b>Average responses</b>	<b>66.86</b>	<b>25.4</b>	<b>21.52</b>	<b>8.2</b>	<b>11.58</b>	<b>4.4</b>

#### 4.3.2 Pathophysiology category

There were ten questions in the pathophysiology category as identified in Table 5.

**Table 5: Questions in the pathophysiology category**

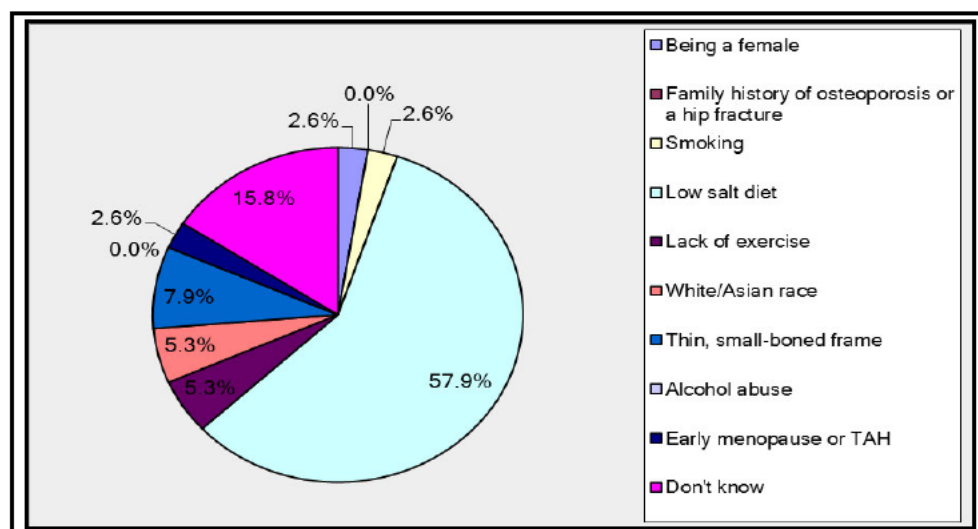
Q2	Women begin to lose bone mass at what age?
Q3	Which of the following does not increase the risk of developing osteoporosis?
Q4	The most serious fracture caused by osteoporosis that can be life threatening is:
Q7	Which of the following is considered the best preserver of bone mass in women?
Q9	Which of the following may be a sign of osteoporosis?
Q12	Which of the following medicines is used to treat osteoporosis?
Q14	The (gold standard)to determine whether or not someone has osteoporosis is:
Q17	An example of medicines increasing the risk for developing osteoporosis
Q18	Taking hormone replacement (estrogen) after menopause may:
Q22	Which of the following is correct

Question 2, regarding the age at which women begin to lose bone mass, was marked by a diverse response as demonstrated in Table 6. “In their 50’s” was correctly identified by only 18.4% (n = 7) participants.

**Table 6: Women begin to lose bone mass at what age?**

Women begin to lose bone mass at what age?		
Answer Options	Response Percent	Response Count
In their 20's	18.4%	7
In their 30's	21.1%	8
In their 40's	36.8%	14
In their 50's	18.4%	7
Don't know	5.3%	2

Demonstrated in Figure 10, identifying risks of osteoporosis in question 3 had a mixed response with only 57.9 % correctly identifying “low salt diet.”



**Figure 10: Which of the following does not increase the risk of osteoporosis?**

In question 4 regarding the most serious fracture caused by osteoporosis that can be life threatening, hip fracture was selected by 60.5% (n = 23), with the remaining participants (39.5%, n = 15) selecting the “spine fracture” option.

In question 7 participants had to identify the best preserver of bone mass in women. The response to this question was diverse as demonstrated in Figure 11. Only 28.9% participant correctly identified “Estrogen”.

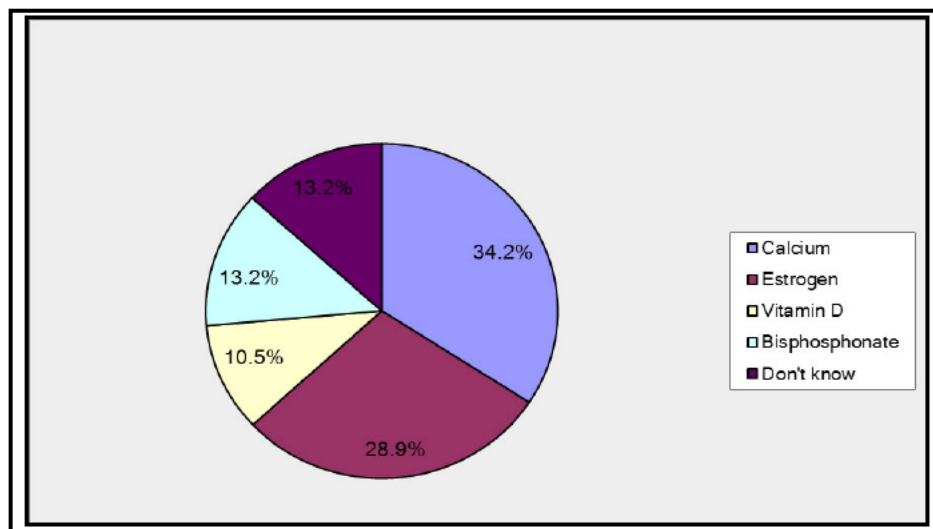


Figure 11: Which of the following is considered the best preserver of bone mass in women?

In question 9 the majority of participants, 89.5% (n = 34) correctly identified a loss of height as a sign of osteoporosis. “Stiff, swollen joints” and “shiny, stiff joints” were selected by 2.6% (n = 1) participant each, followed by 5.3% (n = 2) selecting the “don't know” option.

In question 12 regarding medications used to treat osteoporosis, the bisphosphonates option was correctly selected by 92.1% (n = 35) participants. “Don't know” was the only other selected option in this question.

In question 14 all participants (100%, n = 38) correctly identified a bone density scan as the “gold standard” to diagnose osteoporosis, whilst in question 17 a total of 92.1% (n = 35) identified long term use of prednisone as a risk factor for developing osteoporosis as the correct response. The other options selected in this question included Aspirin (2.6%, n = 1) and “don't know” (5.3%, n = 2).

In question 18 participants had to identify an effect of taking hormone replacement therapy. The fact that hormone replacement therapy decreases bone loss was selected by 65.8% (n = 25) participants. Responses are demonstrated in Figure 12.

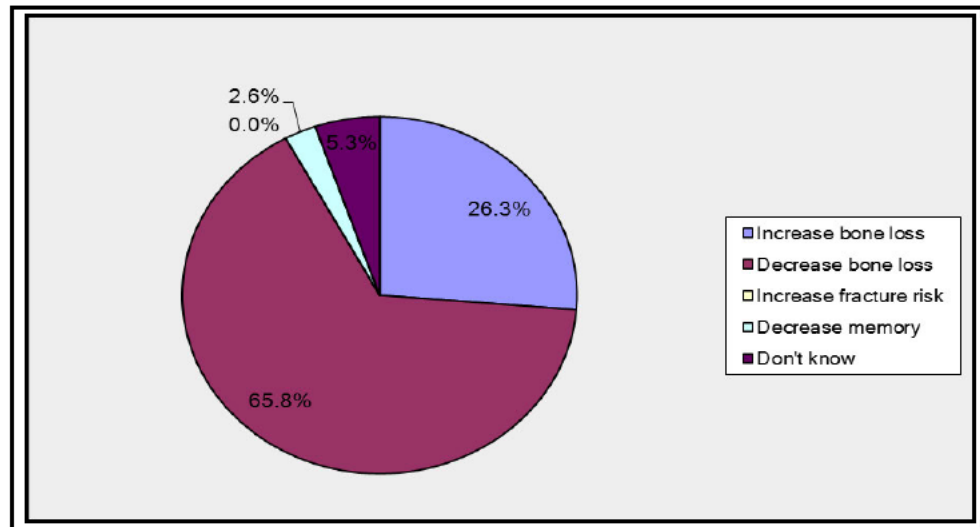


Figure 12: Taking hormone therapy (estrogen) after menopause

In question 22 participants were given a few statements and had to select the correct statement. Results are displayed in Figure 13.

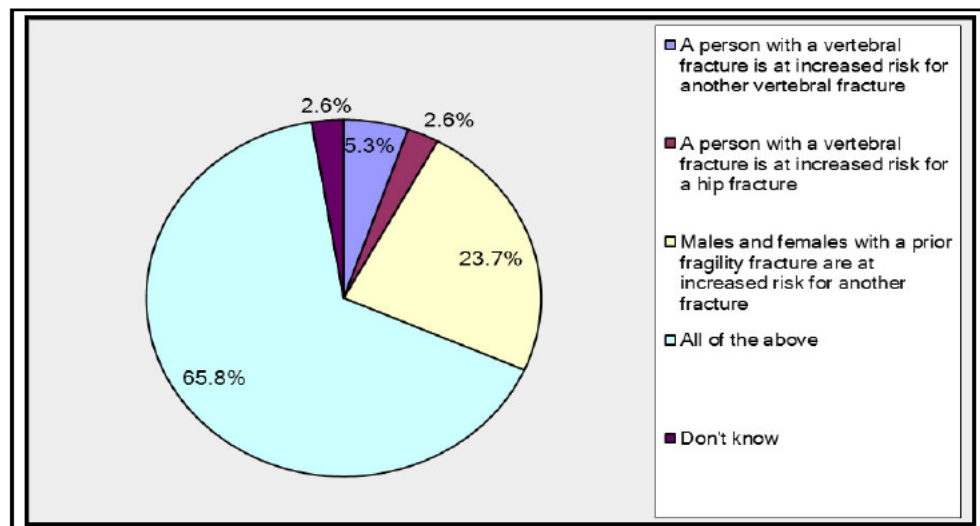


Figure 13: Which of the following is the correct statement?

In the pathophysiology category the number of correct responses varied between 21.1 and 100%, with the average correct responses 67.36%. There was generally higher knowledge demonstrated in this category as demonstrated in Table 7 although lack of knowledge is evident in the number of incorrect (average 26.31%) and “don’t know”

(average 6.07%) responses in a number of questions, totalling an average of 32.38% in negative responses.

**Table 7: Responses pathophysiology category**

Pathophysiology questions		Correct responses		Incorrect responses		Don't know	
		%	n	%	n	%	n
Q 2	Women begin to lose bone mass at what age?	21.1	8	73.6	28	5.3	2
Q 3	Which of the following does not increase the risk of developing osteoporosis?	57.9	22	26.3	10	15.8	6
Q 4	The most serious fracture caused by osteoporosis that can be life threatening is:	60.5	23	39.5	15		
Q 7	Which of the following is considered the best preserver of bone mass in women?	28.9	11	57.9	22	13.2	5
Q 9	Which of the following may be a sign of osteoporosis?	89.4	34	5.3	2	5.3	2
Q12	Which of the following medicines is used to treat osteoporosis?	92.1	35			7.9	3
Q14	The (gold standard)to determine whether or not someone has osteoporosis is:	100	38				
Q17	An example of medicines increasing the risk for developing osteoporosis	92.1	35			5.3	2
Q18	Taking hormone replacement (estrogen) after menopause may:	65.8	25	28.9	11	5.3	2
Q22	Which of the following is correct?	65.8	25	31.6	12	2.6	1
<b>Average responses</b>		67.36	25.6	26.31	10	6.07	2.3

Two questions in the pathophysiology category demonstrated poor knowledge with the number of correct responses below 30%. This included question 2 regarding the age at which women begin to lose bone mass and question 7 regarding treatment considered to be the best preserver of bone mass. Adequate knowledge (above 80%) was demonstrated in four questions only, including questions 9, 12, 14 and 17 displayed in Table 7.

#### 4.3.3 Prevention category

There were eight questions regarding various prevention strategies in this category. Questions in this category endeavoured to test knowledge of areas of prevention of osteoporosis including knowledge of calcium and vitamin D intake, and weight-bearing exercises. Table 8 identifies the questions in this category.

**Table 8: Questions in the prevention category**

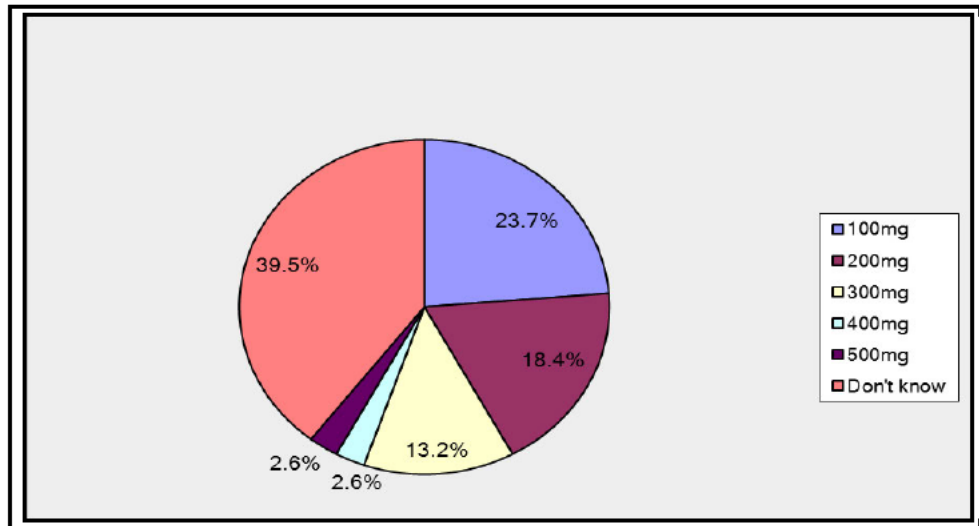
Q5.	What is the recommended daily intake of calcium for women aged 40-49 years who are still menstruating?
Q6.	Food products fortified with calcium generally provides approximately how much calcium per serving:
Q10.	The recommended amount of daily Vitamin D intake needed to help absorb calcium?
Q11.	Which of the following is not an example of weight bearing exercise?
Q13.	Which of the following is the best source of dietary calcium?
Q15.	.It is best to take calcium supplement tablets
Q16.	Which of the following most accurately describes measures to prevent osteoporosis?
Q21.	Which group of activities best describe weight-bearing exercises?

Responses to question 5 regarding the recommended daily intake of calcium for women 40 to 49 still menstruating are demonstrated in Table 9.

**Table 9: RDI of calcium for women 40-49 still menstruating**

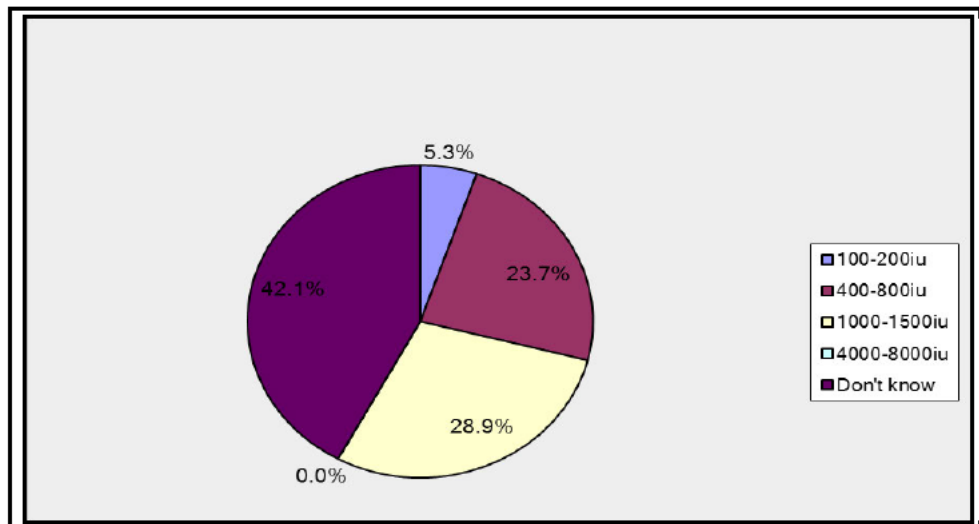
<b>What is the recommended daily intake of calcium for women aged 40-49 years who are still menstruating?</b>		
<b>Answer Options</b>	<b>Response Percent</b>	<b>Response Count</b>
800mg	5.3%	2
1000mg	36.8%	14
1200mg	28.9%	11
1500mg	7.9%	3
Don't know	21.1%	8
	<b><i>answered question</i></b>	<b>38</b>
	<b><i>skipped question</i></b>	<b>3</b>

Food products are fortified with approximately 300mg of calcium. There was a mixed response to question 6 regarding the amount of calcium in fortified food products as demonstrated in Figure 14. Only 13.2% identified “300mg” as the correct option.



**Figure 14: What is the amount of calcium in fortified foods?**

Responses to question 10 regarding the recommended amount of daily Vitamin D intake needed to help absorb calcium when using sunscreen were diverse as demonstrated in Figure 15.



**Figure 15: What is the recommended daily intake of vitamin D when using sunscreen?**

In question 11 participants had to identify the non-weight bearing exercises from a selection of exercises. The majority of participants, 92.1% (n = 35) selected stretching as a non-weight bearing exercise, followed by 5.3% (n = 2) selecting the dancing option and 2.6% (n = 1) selecting the “don’t know” option.

In question 13 regarding the best source of calcium, 84.2% (n = 32) participants selected dairy products, followed by 15.8% (n = 6) selecting the “green, leafy vegetables” option.

In question 15 participants had to indicate the best method to take calcium supplement tablets. Responses to this question were diverse as demonstrated in Figure 16.

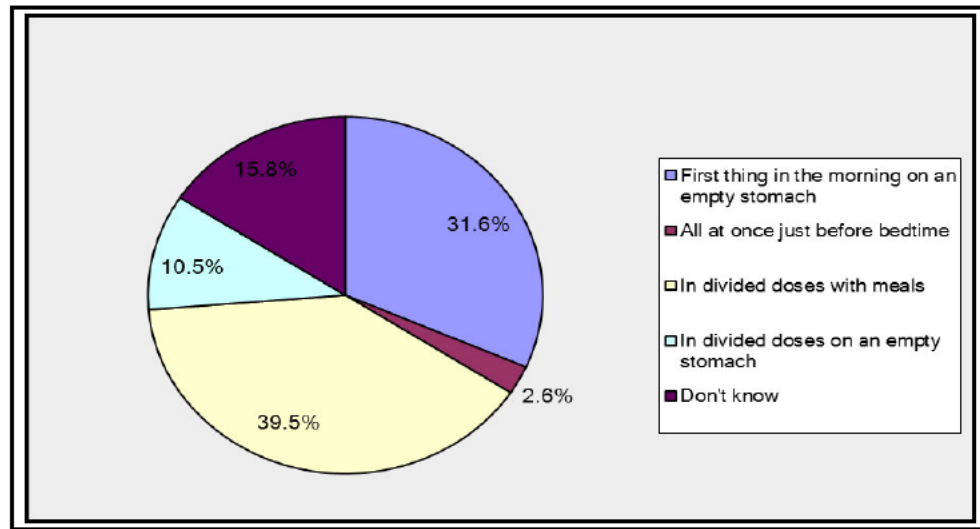


Figure 16: It is best to take calcium supplements

To test knowledge on osteoporosis prevention participants were given statements in question 16 regarding measures to prevent osteoporosis. The “all of the above” option was correctly selected by 92.1% (n = 35) participants. “Taking the recommended amount of calcium daily” was selected by 5.3% (n = 2) and the “weight-bearing exercises” statement by 2.6% (n = 1). Responses to question 21 regarding activities that best describe weight-bearing exercises are demonstrated in Table 10.

Table 10: Which group of activities best describe weight-bearing exercises?

Which group of activities best describe weight-bearing exercises?		
Answer Options	Response Percent	Response Count
Walking, jogging, isometrics, stretching	13.2%	5
Tennis, swimming, yoga, karate	0.0%	0
Hiking, dancing, tennis, stair climbing	81.6%	31
Hiking, swimming, stretching, jogging	5.3%	2
Don't know	0.0%	0
<i>answered question</i>		<b>38</b>
<i>skipped question</i>		<b>3</b>

Knowledge demonstrated in the prevention category was diverse with the number of correct responses varying between 13.2% and 92.1%, an average of 57.9%. The average incorrect responses were 26.95% and “don't know” responses 15.13%,

totalling and average of 51.2% negative responses. The questions and the results are demonstrated in Table 11.

**Table 11: Responses in the prevention category**

Categories of questions and responses		Correct responses		Incorrect responses		Don't know	
		%	n	%	n	%	n
<b>Prevention category</b>							
Q 5	What is the recommended daily intake of calcium for women aged 40-49	36.8	14	42.1	16	21.1	8
Q 6	Food products fortified with calcium generally provides approximately how much calcium per serving:	13.2	5	47.3	18	39.5	15
Q10	If you use sunscreen or avoid sun exposure, which of the following is the recommended amount of daily Vitamin D intake needed to help absorb calcium?	23.7	9	34.2	13	42.1	16
Q11	Which of the following is not an example of weight bearing exercise?	92.1	35	5.26	2	2.6	1
Q13	Which of the following is the best source of dietary calcium?	84.4	32	15.8	6		
Q15	It is best to take calcium supplement tablets	39.5	15	44.7	17	15.8	6
Q16	Which of the following most accurately describes measures to prevent osteoporosis?	92.1	35	7.9	3		
Q21	Which group of activities best describe weight-bearing exercises?	81.6	31	18.4	7		
<b>Average scores</b>		57.9	22	26.95	10.25	15.13	5.75

#### 4.4 Analysing the results on the OKQ

##### 4.4.1 Level of knowledge

Analysing the OKQ, seven questions scored between 91 and 100% and three scored between 81 and 90%. Four questions scored between 60 and 80% and nine questions scored below 60%. These were mainly questions regarding osteoporosis prevention and risk factors for developing osteoporosis. Vered et al. (2008) used the FOOQ and interpreted scores as knowledge being very high when more than 80%, average between 60 and 80% and relatively low when less than 60%. Vered et al. regarded an average score of 17 out of 24 (70.8%) as moderate knowledge. If the knowledge scores of Vered et al. are applied to the current study, the majority of questions (n =10) scored in the very high category, four scored in the average category and nine in the relatively low category. Results for the current study are displayed in Table 12.

**Table 12: Knowledge levels of respondents to the current study**

Q	Very high knowledge base (n=10) 81-100%	
14	Currently, the most widely accepted method (gold standard) to determine whether or not you have osteoporosis is	100%
20	Once women begin to lose bone mass:	97.4%
8	Osteoporosis literally means	97.4%
11	Which of the following is not an example of weight-bearing exercise?	92.1%
12	Which of the following medicines is used to treat OP	92.1%
16	Which of the following most accurately describes measures to prevent OP?	92.1%
17	Taking certain medicines for long periods of time may increase the risk for developing osteoporosis. An example of such medicine is:	92.1%
9	Which of the following may be a sign of osteoporosis?	89.5%
13	Which of the following is the best source of dietary calcium?	84.2%
21	Which group of activities best describe weight-bearing exercise?	81.6%
<b>Average knowledge base (n=4) 60-80%</b>		
23	True or false: NZ Maori has a higher incidence of OP than Pakeha	76.3%
18	Taking hormone replacement therapy after menopause may:	65.8%
22	Which of the following is correct?	65.8%
4	The most serious fracture caused by osteoporosis that can be life-threatening is:	60.5%
<b>Relatively low knowledge base (n=9) Score below 60%</b>		
3	Which of the following does not increase the risk of developing OP	57.9%
15	It is best to take calcium supplement tablets	39.5%
5	What is the recommended daily intake of calcium for women 40-49 still menstruating	36.8%
19	Which of the following statements is not correct?	31.6%
1	What percentage of New Zealand women over the age of 50 will develop osteoporosis?	31.6%
7	Which of the following is considered the best preserver of bone mass in women?	28.9%
10	If you use sunscreen or avoid direct sun exposure, which of the following is the recommended amount of daily vitamin D intake needed to help absorb calcium?	23.7%
2	Women begin to lose bone mass at what age?	21.1%
6	Food products (e.g. orange juice) fortified with calcium generally provides approximately how much calcium per serving?	13.2%

#### 4.4.2 Analysing age of participants and knowledge scores

Analysing the knowledge scores of the various age groups (Appendix 5), the over 50 years of age group (n = 21) scored the highest, with an average score of 15.47 (67%) out of a possible 23. This score is 2.71% above the mean score of 64.29%. The 41-50 years of age group (n = 9) scored an average of 13.8 (59.9%), 4.39% below the mean score and the 31-40 years of age group (n = 6) 15.6 (56.52%), 7.77% below the mean score. The lowest average score was achieved by the age group 20-30 (n = 2) scoring an average of 11.5 (49.9%), 14.39% below the mean score.

#### 4.4.3 Place of work and knowledge scores.

The categories for place of work (Appendix 6) included in the questionnaire were that of tertiary DHB, secondary DHB or private hospital. The average score of participants working in a tertiary DHB (n = 20) was 14.3 (62.2%) as opposed to the 15.31(66.57%) scored by participants working in smaller DHB (n = 16) and the average score of 15.5 (67%) scored by participants working in the “other” category (n = 2). This category included a private hospital and a participant not currently active in practice. One of these participants had a masters’ degree.

#### 4.4.4 Years’ experience and knowledge level.

With an average score of 15.5 out of a possible 23 (67.3%), participants with more than 10 years’ experience (n = 20) generally scored higher than participants with less experience (Appendix 7). This is demonstrated by the 5-9 years’ experience group (n = 7) scoring an average of 13.8 (60%) and the 1-4 years’ experience category (n = 11) scoring 14 (61%).

#### 4.4.5 Qualifications and knowledge of osteoporosis

Analysing the scores among the different qualification categories (Appendix 8), it was evident that the highest scores were achieved by “the other” category which included mainly overseas trained participants. This group scored an average of 15.75 out of a possible 23 (68.4%), 4.11% more than the mean score of 64.29%. The lowest scores were achieved by the mainly New Zealand trained Bachelor of Nursing group scoring an average of 13.2 (57.7%), which is 6.59% below the mean score. Participants with a formal orthopaedic-related qualification scored an average of 14.75 (64.1%), 0.19% below the mean score and participants with a post-graduate qualification scored an average of 15.6 (67.8%), 3.5% higher than the mean score. This provides evidence that post-graduate study did not dramatically increase osteoporosis knowledge amongst New Zealand Orthopaedic Nurses.

## 4.5 Nurses' attitudes and perceptions

This section consisted of mainly open-ended questions and was completed by 29 participants. A general inductive approach for qualitative data analysis was implemented to analyse the data in this section to establish units of meaning and the categories or themes and sub-categories. The aim of an inductive approach is to reflect on frequently reported patterns in qualitative data categories (Thomas, 2003). Thomas states that the primary mode of analysis is the development of categories from the raw data into a model or framework that captures key themes that is important to the researcher. It is also suggested by Thomas that the top-level categories are used as main headings in writing up the findings, with specific categories as sub-headings.

### 4.5.1 Perceived role in the prevention of osteoporosis

In question one the participants were asked what they perceived to be the role of the nurse in the prevention of osteoporosis. The main theme identified in the analysis of the data was that of education. Sub themes suggested by participants were that of increasing awareness, identifying risk factors, prevention, referral, diagnosis and treatment.

#### **Education**

A consistent theme that emerged from responses to this question was that of education. The majority of participants (n = 21) thought that education is part of their role. This included education for patients and their families, other nurses and health care professionals and self-education to increase knowledge. One participant suggested that "education is key" whilst another identified the fact that nurses themselves need to be educated, stating

*Education- ...This means being educated themselves of the facts [R19]*

*By educating the clients we see how to keep our bones healthy and the importance of monitoring our bones in the prevention of developing osteoporosis [R6]*

Other important educational roles identified included

*Being aware of patients admitted with a fracture and ensuring they have had education about osteoporosis - if not already happened from their GP's/practice nurses [R21]*

*Ensuring good education re healthy lifestyle living, regular GP assessments, maintaining good dietary intake, education on the importance of medication [R14]*

*Education and informed decision making for the patient [R30]*

It was correctly identified by one participant that osteoporosis education and prevention should start early in life, stating

*Educating patients about osteoporosis and what things they can do to help prevent it from even childhood eg. food, avoid smoking etc. [R18]*

### **Increasing awareness**

Increasing awareness, including own awareness, is an important aspect in the prevention of osteoporosis. Participants identified this as part of their role, stating

*Education - also increasing awareness. This means being educated themselves of the facts [R19]*

*To make patients aware of osteoporosis and to encourage them to seek investigation and treatment if at risk or to advice on prevention strategies [R12]*

*To raise awareness of patients and provide appropriate information and advice [R35]*

### **Identifying risk factors**

Participants identified OP risk factors as the aspects on which patients need education. This includes letting patients know about the importance of calcium and vitamin D, advising patients of things to be aware of, preventative measures, raising awareness of patients and providing appropriate information and advice. Education on lifestyle and the supplements available has also been identified as an important aspect in the nurses' role. Some participants gave short succinct descriptions of the role of an orthopaedic nurse, stating that the role included

*Educating regarding diet, medications and exercise [R9]*

*Educating the client on diet and weight-bearing exercise, risk factors etc [R10]*

*Identifying risk factors and advising patients of thing to be aware of [R39]*

*Education about lifestyle and supplements available so they can be informed and proactive towards own health [R28]*

*Ensure patients have correct and adequate dietary intake or give additional nutritional supplements where appropriate [11].*

Another participant suggested

*Education and advice on strategies to reduce the risk of osteoporosis to patients especially those at high risk [R33]*

### **Prevention**

The role of prevention was not a predominant category / theme but linked to either that of education, increased awareness or risk factors. Participants perceived their role in prevention as

*Education of preventive measures, i.e. risks of- smoking, not exercising, low calcium dietary intake, not enough exposure to sunlight [R36]*

*Give information on prevention and treatment [R34]*

*Encouraging pt to exercise regular having a healthy diet not to smoke may drink in moderation [sic] [R24]*

*Education around prevention, diet, exercise, symptoms etc. Being the patient advocate and referring them on to have necessary tests and treatments if necessary [R25]*

### **Referral, diagnosis and treatment**

In regards to referral patterns, participants suggested referring patients for DEXA scans or providing patients with the appropriate information regarding where and how to access DEXA scans. Perceptions regarding the nurses' role in this included

*To be able to identify and refer patients for bone density scans as required and advise follow-up with their GP for results [R32]*

*.....and early assessment and diagnosis [R16]*

*Prompting doctors [R1]*

*Encouraging Dr to get patient a DEXA scan and / or commence bone protection medication [R31]*

*Referral to specialists [R13]*

A more passive role in the prevention of osteoporosis identified by participants, included

*Administering correct medications for osteoporosis at the right time etc. i.e. [sic] sitting up in chair for 1/2 hr b4 breakfast [R11]*

*Ensuring they are commenced on preventable medications (Fosamax) [R9]*

In summary, aspects of the nurses' role include educating the client on diet, weight bearing exercises, risk factors, medications and bone health as described by one participant

*By educating the clients we see how to keep our bones healthy and the importance of monitoring our bones in the prevention of developing osteoporosis [R6].*

#### 4.5.2 The barriers to educating clients about osteoporosis

In question two participants identified a variety of barriers to educating clients about osteoporosis. The predominant theme identified was the lack of “essential” knowledge by the nurse, identified by eleven participants as a barrier. Other themes that occurred are that of lack of time, communication issues and reluctance of patients to change their lifestyle.

##### ***Lack of knowledge by the nurse***

Completing the questionnaire enhanced participant’s awareness of their lack of knowledge of osteoporosis. Statements included

*My own knowledge base which is clearly lacking [R39]*

*Lack of nursing knowledge to share with our clients [R6]*

*Lack of understanding of the condition themselves....Limited exposure to the condition and knowing the T-scores [R21]*

*Not having information at hand to give to patients. Not enough knowledge [R34]*

##### ***Lack of time***

Lack of time, especially in acute settings was identified by nine (n = 29) participants as a barrier. Some find that when patients are admitted after a fracture, there is “too much going on” and that patients are in no condition to take on new information. There is “not enough time to spend with individual patients” [R32] and no time to give “in-depth information” [R31]. Time in the clinic was also identified as insufficient to deliver education.

##### ***Communication issues***

A third theme involved the patient’s understanding of, and willingness to change their lifestyle. This included statements regarding communication barriers such as language and the patient’s ability to understand. Responses included the following statements

*Not sure if they will take on board the education [R14]*

*Lack of understanding...cultural differences... language barriers [R30]*

##### ***Reluctance to change***

Participants identified a reluctance to change, with patients not taking OP seriously, a reluctance to change their behaviour and lifestyle, and denial as barriers to osteoporosis education. As stated by one participant the “patients’ own perception of

osteoporosis and eagerness to learn” is clearly identified as a barrier. Responses included the following statements

*The lack of wanting to change things. By the time the clients are in hospital for e.g. a fracture a large majority are ok and may not want to change [R9]*

*Clients’ reluctance to change lifestyle habits [R10]*

*Patients who are already participating in activities that will increase their own risk and do not wish to change lifestyle [R19]*

### **Other sub-themes**

One other theme suggested by participants was financial issues, including increased prices of dairy products and the cost of food and supplements which may give rise to poor diets. Some participants viewed the slip, slop and slap campaign and lack of enough sunlight exposure as a barrier. The issue of who is responsible for managing osteoporosis has been highlighted by one participant who stated that there is an expectation that General Practitioners will follow up with treatment [R33].

#### 4.5.3 Educational needs of nurses

The aim of question three in section 3 was to establish the aspects of osteoporosis on which nurses needed more education or information. No clear theme or category could be identified as the responses to this question were diverse and covered most of the aspects nurses need to know in order to be able to give education to clients, with a few stating they need “a general knowledge” [R34] on “all aspects” [R36] and “whatever is available” [R24]. One participant expressed enhanced awareness with completing the survey stating

*I have good relationships with Osteoporosis NZ and will do some more reading for myself after completing this survey [R19].*

Other specific educational needs identified by participants included aspects such as bone health, prevention strategies including best ways to educate patients, diet and non-drug therapies, treatment options including the use of bisphosphonates, and recommendations including bone density measures.

#### 4.5.4 Preferred method of gaining knowledge about osteoporosis

Participants were asked to identify their preferred method of gaining knowledge about osteoporosis. More than one option could be selected. As demonstrated in Figure 17 the major preferred methods were that of on-line study, in-service and a study day. The comment on the “other” option selected by 3.4% (n = 1) was “any or all of the above”.

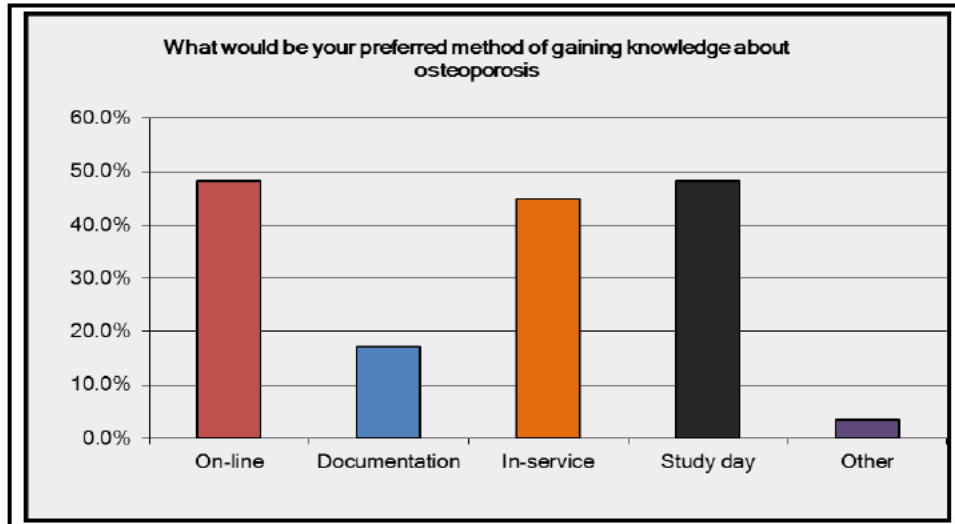


Figure 17: Preferred method of gaining knowledge about osteoporosis

#### 4.5.5 Who is responsible for referring clients for a bone density scan?

The majority of participants did not perceive themselves as playing a role in the referral of patients for bone density scans. As shown in Figure 18 only 34.5% (n = 10) of participants regarded this as a nurses' role.

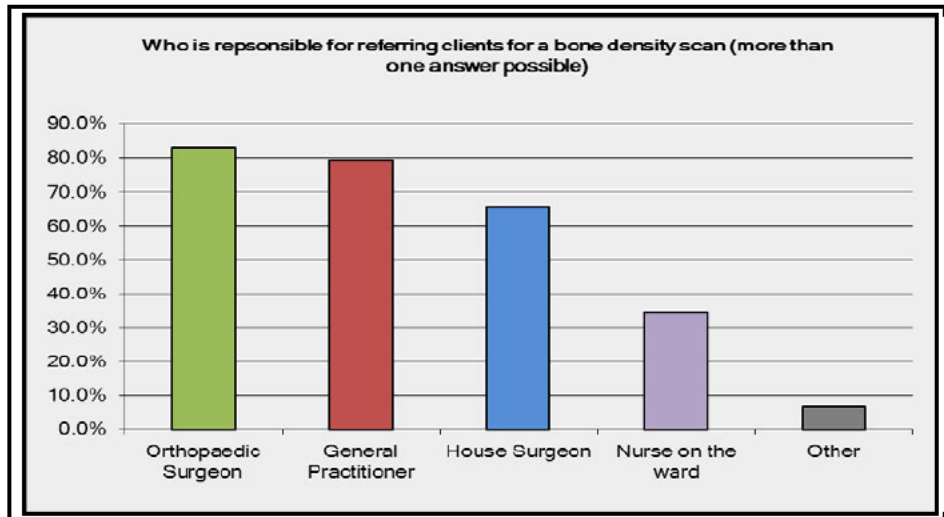


Figure 18: Responsible for referring clients for a bone density scan

#### 4.5.6 Perceived risk for developing osteoporosis

Participants were asked whether they considered themselves to be at risk for developing osteoporosis. Taking into account that the majority of participants (56.1%, n

= 23) were in their fifties, participants did not significantly perceive themselves to be at risk for developing osteoporosis. Responses are displayed in Figure 19.

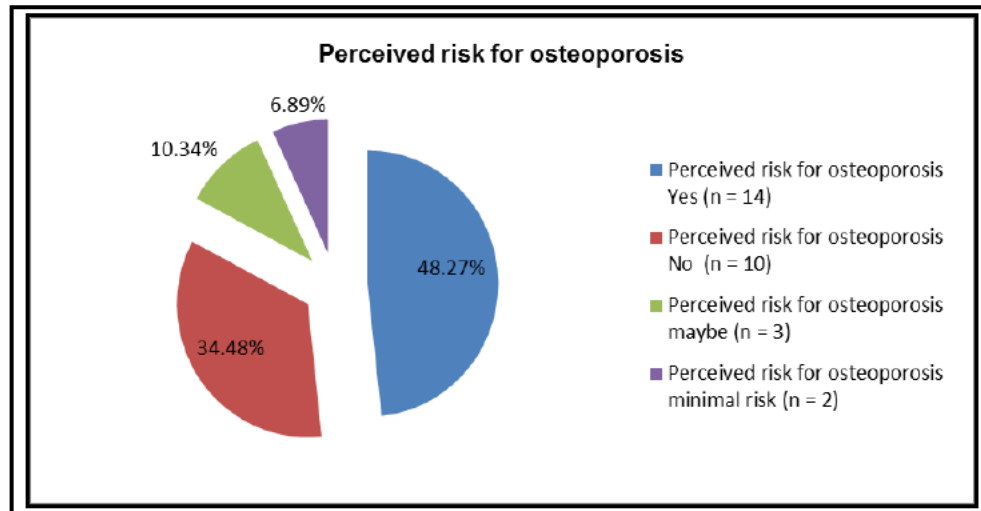


Figure 19: Participants' perceived risk for osteoporosis

Responses from the group that perceived themselves to be at no risk of OP were analysed separately. Responses included

*No. I exercise regularly, I eat a well-balanced diet with enough natural calcium and I always go outside for a spell each day. I have no family history of it. I do not smoke or drink to excess [R25].*

*No family history...adequate diet and lifestyle..! [R30].*

*No. No family history, diet with good amounts of dietary calcium, regular weight bearing exercise [R3].*

Participants selecting “maybe” as an option answered with quotes such as “age group” [R35], “possibly - had poor calcium intake as a teenager. Grandmother had osteoporosis” [R12] and “diet, eat on the run due to shift work, take easy food” [R28].

One participant in this group stated the following:

*There is always a possibility, however I think my likelihood would be low as there is currently no history in my family. I am active & eat well [R1].*

The group who selected “minimal risk” gave the following reasons for their answer

*Minimal risk - no family history, have always had healthy diet with plenty of dairy products in my younger time, do weight bearing exercises, never had a fracture and have had a bone density scan done when I was 35 ( part of a research project to give some base line data) [R21];*

*Minimal risk - I am post-menopausal and took prednisone for about 18 months in my 20s. I do weight-bearing exercise 3-4 times a week. I have a good diet including calcium rich foods and good protein [R19].*

Participants who perceived themselves to be at risk gave the following statements:

*Yes, female nearing forty, on dairy free diet, don't do much exercise [R40].*

*Yes, as am Pakeha woman, peri-menopausal with daily alcohol intake (one unit) [R39].*

*Yes, have consumed minimal amounts of dairy products since a baby [R36].*

*Yes all of us have a potential to develop it as we age [R34].*

*Yes. I had a TAH + BSO at age 39, I was on HRT until age 54 [R33].*

*Yes, in age 50+, low body weight, European [R31].*

*Yes – family history. Need to eat more calcium!! [R23].*

*Yes small body frame, do not eat an adequate calcium diet [R18].*

*Yes, female and don't eat enough dairy [R17].*

*Yes because I do not know if I take enough Ca [R16].*

*Yes. But try to get enough exercise and a balanced diet [R13].*

#### 4.5.7 Current role in promoting bone health in clients

Participants were asked whether they were currently playing a role in promoting bone health in clients and if they did, how often and what they did. The majority, (55.2%, n = 16) indicated they played a role in promoting bone health, 37.9% (n = 11) selected the 'no option' and 6.9% (n = 2) the 'not applicable' option. One participant commented that bone health promotion happens "within the ward setting with patients of varying age groups" [R35] whilst another stated it happens in fracture clinics [R12]. A mixed response was given on the question of how often and what they do as an orthopaedic nurse to promote bone health and prevent osteoporosis in their clients. The frequency of activities varied from "daily", "as necessary" or "if needed", "sometimes", "occasionally" to "not sure". Lack of time was given as one reason why nurses are not promoting bone health.

*Not sure how often I talk to clients about bone health it comes up regularly in general conversation with clients who have fractures or already have osteoporosis [R10].*

Participants reported the use of various methods to promote bone health including information leaflets, advice regarding prevention strategies such as nutritional advice, healthy living, exercise, and smoking cessation. Some participants gave detailed explanations of what they do to promote bone health and others commented on strategies used to promote bone health. These statements included

*Advise patients that break their bones to try and eat a better diet and also I try to get them to give up smoking [R18].*

*I promote good health and ensure patients are eating green vegetables and fruit. I encourage patients to get out of bed to mobilise more and give praise when they are doing their physio exercises well [R11].*

*I am able to encourage patients to minimise their risks of osteoporosis by identifying those most at risk and giving information re prevention strategies and encouraging follow-up for DEXA scan via GP for confirmation of the disease [R33]*

One participant who scored 39% on the osteoporosis knowledge questionnaire is actively promoting bone health by giving education about diet and exercise. One reason for lack of bone health promotion activity is explained by one respondent, stating

*Usually by the time we see our patients in the acute orthopaedic setting, the fracture is already there. We can educate post fracture or bony injury, but the real education needs to be in the community [R6].*

#### **4.6 Summary**

This chapter presented the findings of the study. The majority of participants were over 50 years of age, well qualified females with more than ten years' experience in the orthopaedic setting. The findings have identified the experience and education, osteoporosis knowledge and the attitude and perceptions of orthopaedic nurses in their role in the prevention of osteoporosis. The number of mixed responses indicated that participants did not have adequate knowledge of osteoporosis and that they had diverse perceptions of their role in the diagnosis and prevention of osteoporosis. The analysis and discussion of the findings in relation to the literature review and the aims of the study are presented in Chapter 5.

## CHAPTER 5

### DISCUSSION

#### 5.1 Introduction

Findings in the previous chapter reveal that the majority of participants are over the age of 50 years, well-educated with more than 10 years' experience in working with orthopaedic patients. However, the findings of this descriptive exploratory study show that nurses working in orthopaedic departments do not have adequate osteoporosis knowledge in order to provide osteoporosis education to patients. Age, gender, years of experience and area of practice did not seem to have increased nurses' knowledge of osteoporosis. Lack of knowledge of osteoporosis is evident in the incorrect and "don't know" responses to a variety of questions. Furthermore, the majority did not perceive themselves to be at risk of either having or developing osteoporosis.

#### 5.2 Discussion

##### 5.2.1 Age and experience of participants and knowledge level

The NZ nursing workforce is an ageing one, with 37% active Registered Nurses in New Zealand aged 50 or older (Nursing Council of New Zealand [NCNZ], 2010). As demonstrated in Figure 4, the age of participants in this study reflect the age of the nursing workforce as reported by the NCNZ. With menopause occurring in most Western women between the ages of 45 and 55, with the average age of 50-51 years (Murtagh, 2005) an estimate of 78.1% (n = 32) of participants over 40 years of age were at-risk for developing osteoporosis. However in question one most participants were unaware that 50% of New Zealand women over the age of 50 years will develop osteoporosis. It is alarming that a large majority of participants were unaware of the at risk age for developing osteoporosis, that women begin to lose bone mass in their 30's and that estrogen is the best preserver of bone mass in women. In question 19 the majority of participants could not identify "decreasing bone mass is part of the normal ageing process" as the incorrect statement. Lack of knowledge regarding risk factors and prevention are evident. These mainly include aspects regarding calcium and vitamin D intake. Lack of knowledge regarding the correct administration of calcium tablets and the recommended daily intake of calcium is evident; though the majority of participants suggested that they consume enough calcium to prevent osteoporosis. Gueldner et al. (2008) suggest that sunscreen with a sun protection factor (SPF) of 8 and more almost completely blocks vitamin D production. However, only 23.7% participants could identify the correct amount of Vitamin D supplements needed when

sunscreen is used or sunshine is avoided. This is surprising in the view of the “slip, slop and slap” campaign for the prevention of skin cancer in New Zealand.

What is also surprising is the fact that 39.5% (n = 15) experienced orthopaedic nurses incorrectly selected “spine fracture” as the most serious fracture that could be life threatening. This is in contradiction to the 72% of senior nursing student’s correctly selecting “hip fracture” in the study by Berarducci (2004).

Adequate knowledge was demonstrated in a number of questions. All but one participant knew that osteoporosis means “porous bones” and that treatment is available once a woman begins to lose bone mass. The majority of participants knew that a loss of height may be a sign of osteoporosis. All the participants knew that a bone density scan is the gold standard to diagnose osteoporosis. In question 12 only three participants did not know that bisphosphonates is used to treat osteoporosis.

Terrio and Auld (2002) assessed knowledge on calcium intake and weight-bearing exercises by different age groups and concluded that older women did not know more about osteoporosis than younger women. Findings from the study by Hannon and Murphy (2007) show a positive correlation between age and knowledge. Contradictive to the study by Terrio and Auld but similar to the conclusions by Hannon and Murphy, the age group 50+ in the current study scored the highest in the OKQ followed by the age group 31-40 (n = 6). The lowest average score was that of the age group 20-30 (n = 2), yet this age group had a 100% perception of developing osteoporosis, supporting the conclusion by Piehowski et al. (2010) that pre-menopausal women have a higher perceived seriousness for osteoporosis than post-menopausal women, although not necessarily the knowledge as has been demonstrated in the current study.

Von Hurst and Wham (2007) thought there was a small, significant increase in knowledge with increasing age, particularly in 40-49 year old women. Though nurses in this age group scored marginally higher than other age groups in the current study, their knowledge was only marginally more than that of lay women. Hannon and Murphy (2007) reported a positive correlation between years post-qualification and knowledge of osteoporosis amongst nurses and midwives. Participants to the current study were all engaged in active practice with the majority (n = 20) having more than 10 years’ experience in working with orthopaedic patients. Similar to the results in Hannon and Murphy, the average score amongst the 10+ years’ experience group was marginally higher than the other groups. Although not notably different, the group with 5-9 years’ experience (n = 7) had the lowest average score. Working at a tertiary District Health Board (DHB) had no influence on knowledge of osteoporosis of participants in the

current study evident by the lack of major differences in the scores of the secondary and tertiary DHB participants.

### 5.2.2 Educational background and knowledge level

In regards to educational background, findings in this study were similar to that of other studies, namely that post-graduate study including a master's degree or formal training in orthopaedic-related diseases did not increase osteoporosis knowledge. Werner (2005) suggested that previous information or experience and higher education are positively associated with a higher level of osteoporosis knowledge; however Hannon and Murphy (2007) reported no statistical link between a post-graduate qualification in orthopaedics and scores on the questionnaire used in their study, namely the Facts on Osteoporosis Quiz (FOOQ). Similarities between the knowledge scores of nurse participants and lay people were reported by Berarducci et al. (2002). With similar average scores between the current study and that of Berarducci et al., the conclusion can be drawn that New Zealand Orthopaedic Nurses have the same level of knowledge as lay people; therefore they do not have adequate knowledge to provide the necessary education to patients.

### 5.2.3 Nurse's perception of own risk for developing osteoporosis

Personal beliefs influence health behaviour (Hayden, 2009), therefore participants were asked whether they perceive themselves at risk for developing osteoporosis. The majority of participants in this study over 40 years of age did not perceive themselves to be at risk for developing osteoporosis. Apart from inadequate knowledge, the perceived low risk for developing osteoporosis demonstrated by participants is of particular concern as it seems that being at the at-risk age for the onset of menopause did not increase the participants' knowledge or perceived susceptibility of osteoporosis. Lack of perceived risk was evident as only 48.27% (n = 14) of the 29 participants responding to the question perceived themselves to be at risk for developing osteoporosis. Ten participants (34.48%) considered themselves not to be at risk, three (10.34%) thought they may be at risk and two (6.89%) perceived themselves at minimal risk. However, it should be acknowledged that the majority of participants reported no family history of osteoporosis as displayed in Table 2.

Apart from one participant who associated perceived risk with a family history of osteoarthritis, those who perceived themselves to be at risk gave valid statements to motivate their answers. These included inadequate calcium intake, small body frame, family history, menopause and Pakeha descent. The majority of the 50+ year group who perceived themselves not to be at risk or at minimal risk all stated they exercise

regularly, take enough calcium and ensure sun exposure. However, neither of these participants could give the correct response to the questions regarding vitamin D, calcium and calcium supplement intake. Ironically, the only age group who perceived themselves to be at risk for osteoporosis were the 20 – 30 year age group (n = 2). Although there was a low perceived risk perception amongst 50+ years' participants, this group scored the highest in the OKQ (Appendix 5).

One of the possible reasons for inadequate knowledge of osteoporosis could be attributed to lack of perceived susceptibility for developing osteoporosis amongst participants in the current study. Johnson et al. (2008) were concerned about the low level of susceptibility, seriousness and health motivation in view of the impending osteoporosis epidemic. Lack of perceived susceptibility could result in less effort given toward protective actions against osteoporosis (Ford et al., 2007). Ailinger and Emerson (1998) linked the lack of knowledge among lay women to nurse's failure to warn their clients about osteoporosis. This highlights the necessity for nurses to educate women concerning the risk factors and prevention strategies associated with osteoporosis. Therefore, in order for nurses to play a role in osteoporosis prevention, nurses need to increase their knowledge of osteoporosis, increase their own risk perception and actively engage in their own osteoporosis prevention. Berarducci (2008) suggests nurses need to take care of their own bone health. Lifestyle changes are required to effectively prevent the onset of osteoporosis (Brecher et al., 2002). It is suggested by Piehowski et al. (2010) that changing own behaviour links strongly to personal beliefs and risk perception and that people would not engage in health-seeking behaviour if they do not perceive themselves to be at risk. Lack of perceived risk of the post-menopausal age group has been evident in other studies. Williams et al. (2002) found a statistical link between low knowledge of participants and low perception of risk for developing osteoporosis. Nurses should model healthy behaviour (Spencer, 2007) however, for nurses to become behavioural-change agents, they should first reflect on their own behaviour and perceived risk for developing osteoporosis. Whitehead (2001) suggests that with further knowledge and understanding of their practices health educators are far more likely to achieve a degree of success in the behavioural-change encounters as well as approach the intervention with a far more realistic expectation of outcome.

#### 5.2.4 Barriers to counselling of patients

It is evident from the responses by participants in this study that a large proportion of participants are not actively participating in bone health promotion in the acute setting. Barriers identified in this study are similar to barriers identified in studies by Vered et al.

(2008) and Rouhe (2008) as discussed in the literature review. Rouhe identified a disparity between bone health education and clinical treatment of patients. Although bone health education in the hospital seems uncommon, it is nevertheless essential (Rouhe, 2008) and there is an expectation that nurses dedicate time to counsel patients on osteoporosis (Berarducci et al., 2002). Rouhe identified patient compliance with taking medication, not following treatment and perceived risk and futility as patient barriers and barriers experienced by nurses as cost, time, physician support, qualifying coordinating personnel, appropriate educational material, patient understanding, and compliance with follow-up. Using a Likert scale, Vered et al. (2008) listed the following options as barriers for participants to select, including It's not part of my job, lack of time, more urgent issues, lack of confidence regarding ability to counsel, perception that patients will not change their behaviour and uncertainty that nutritional and activity change will reduce the risk for osteoporosis. From these options the participants selected "more urgent issues (50%) and lack of time (40%). Self-confidence and efficacy of risk reduction was chosen by 6% and 19% respectively. Participants in the current study reported similar barriers to counselling as identified in the study by Vered et al. including lack of time and unwillingness to change behaviour. Participants in the current study added lack of nurses' knowledge and patients' inability to understand as other important barriers to counselling patients about osteoporosis. A positive finding is that none of the participants in the current study responded that it was not their job, reinforcing the fact that they perceive themselves to play a role in osteoporosis prevention.

#### 5.2.5 Educational needs of nurses regarding osteoporosis knowledge

Analysing the question regarding participants' educational needs on osteoporosis, it is clear that orthopaedic nurses in New Zealand reflected upon their own knowledge as inadequate. There is a perceived need for expansion of osteoporosis knowledge amongst participants of this study. Similar to the study by Hunt and Repa-Eschen (1998) participants expressed an interest in a study day and on-line education as the preferred method to increase their knowledge. Knowledge of nutritional aspects such as calcium and vitamin D intake is essential knowledge for nurses (Werner, 2005) though it is evidently lacking in participants in this study.

#### 5.2.6 Comparison with other studies among nurses

The scores of the current study were very similar to the range in the study by Berarducci (2004) which was between six and 20 out of a possible 22 correct answers. Berarducci attributed the broad range to the type of clinical practice the students were

involved in before the study. In this study all the participants were working in a similar environment.

Similar to the study by Berarducci (2004) and Vered et al. (2008), there were knowledge deficits regarding osteoporosis preventive and lifestyle behaviours. These included knowledge regarding the best time to take calcium supplements to maximise absorption, the amount of calcium generally found in fortified foods and the recommended daily intake of vitamin D for adequate calcium absorption. Berarducci highlighted the importance of this knowledge for both personal and patient-related health promoting behaviours. It is evident that in the six years since the study by Berarducci was published, nurses have not increased their knowledge regarding osteoporosis. Participants in this study scored similar to the study by Vered et al. (2008) on the definition of osteoporosis and the correct administration of calcium carbonate, but had better knowledge regarding signs of osteoporosis.

Similar to the study by Giangregorio et al. (2007), the current study assessed knowledge of nurses working specifically with patients with fractures or who were at risk of fractures. Gaps in osteoporosis knowledge among these nurses were evident though the expectation was there would be fewer gaps in their knowledge. The comparison of the findings of this study to the studies conducted by Berarducci (2004) amongst senior nursing students and the study by Giangregorio et al. (2007) conducted amongst health care professionals using the same instrument, presented marginally similar mean scores but diverse results in the different categories and individual questions.

Apart from the use of bisphosphonates to treat osteoporosis, gaps in knowledge were similar to the study by Giangregorio et al. (2007) The authors reported large gaps in knowledge about the prevalence of osteoporosis, the recommended daily intake of calcium, the amount of calcium in fortified foods, the recommended daily intake of vitamin D and that calcium should be taken in divided doses with meals. Similar to Giangregorio et al, the majority of participants of the current study did not know the age at which bone loss begins or that estrogen is one of the best preservers of bone mass in women. Of particular concern in this study is that 39.5% participants did not know that a hip fracture could be potentially lethal.

The mean score of the current study (64.29%) sits between the mean score of Berarducci (2004) (66.46%) and Giangregorio et al. (2007) (61.07%). Omitting question 23 regarding the prevalence of osteoporosis amongst Maori versus Pakeha added to this study did not change the outcome. There were seven questions in which

participants of this study scored higher than the other two studies as portrayed in Table 13. Participants scored significantly higher in the question regarding medicines used to treat osteoporosis, the question on long-term risk of using medication such as prednisone and the gold standard for diagnosis of osteoporosis. These are all activities relevant to medical practice. The question regarding signs of osteoporosis scored marginally higher than the other studies. Although participants in the current study scored higher in the questions regarding the recommended daily intake of calcium for women 40-49 still menstruating, the score was still very low (see Table 13).

**Table 13: Questions that scored higher than other studies in the OKQ**

<b>Questions that scored higher than other studies (n=7)</b>		<b>Berarducci, 2004 Student nurses (n = 95)</b>	<b>Giangregorio et al., 2007 HCP (n = 129)</b>	<b>Current study, 2010 Orthopaedic Nurses (n=38)</b>
8	Osteoporosis literally means	96%	92.2%	97.4%
9	Which of the following may be a sign of osteoporosis?	70%	79.8%	89.5%
12	Which of the following medicines is used to treat OP	71%	58.9%	92.1%
14	Currently, the most widely accepted method (gold standard) to determine whether or not you have osteoporosis is	71%	86.8%	100%
17	Taking certain medicines for long periods of time may increase the risk for developing osteoporosis. An example of such medicine is:	73%	72.9%	92.1%
20	Once women begin to lose bone mass:	91%	92.2%	97.4%
5	What is the recommended daily intake of calcium for women 40-49 still menstruating	20%	16.3%	36.8%

The majority of questions (n = 15) scored lower than both or one or the other. There were nine questions in which participants in this study scored lower than both the other studies. Knowledge that was significantly lower includes knowledge regarding the age when women begin to lose bone mass, the recommended daily intake of vitamin D supplements and the administration of calcium supplements.

Knowledge more than 10% lower than the scores in Berarducci (2004) but only marginally lower (less than 10%) than that of Giangregorio et al.(2007) are demonstrated in Table 14.

**Table 14: Questions that scored less than other studies in the OKQ**

<b>Questions that scored less than other studies (n=9)</b>	<b>Berarducci, 2004 Student nurses (n=95)</b>	<b>Giangregorio et al., 2007 HCP (n=129)</b>	<b>Current study, 2010 Orthopaedic Nurses (n=38)</b>
2 Women begin to lose bone mass at what age?	39%	38%	<b>21.1%</b>
3 Which of the following does not increase the risk of developing OP?	77%	59%	58%
7 Which of the following is considered the best preserver of bone mass in women?	56%	31%	<b>28.9%</b>
10 If you use sunscreen or avoid direct sun exposure, which of the following is the recommended amount of daily vitamin D intake needed to help absorb calcium?	60%	52%	<b>23.7%</b>
11 Which of the following is not an example of weight-bearing exercise?	93%	94%	92%
15 It is best to take calcium supplement tablets	58%	50.4%	<b>39.5%</b>
18 Taking hormone replacement therapy after menopause may:	80%	69.8%	<b>65.8%</b>
21 Which group of activities best describe weight-bearing exercise?	90%	87.6%	<b>81.6%</b>
22 Which of the following is correct?		72.9%	<b>65.8%</b>

Participants scored between the two studies in six of the questions. Four questions scored higher than the study by Giangregorio et al. (2007) but lower than the study by Berarducci (2004). These included questions regarding the percentage of women over 50 years that will develop osteoporosis, the most serious fracture and the incorrect statement regarding facts on osteoporosis. There were two questions in which participants scored similar or higher than Berarducci but lower than Giangregorio et al. This included questions regarding measures to prevent osteoporosis and the best source of calcium. Details are provided in Table 15.

**Table 15: Questions that scored between the two other studies in the OKQ**

<b>Questions that scored between the two other studies (n=6)</b>	<b>Berarducci, 2004 Student nurses (n=95)</b>	<b>Giangregorio et al., 2007 HCP (n=129)</b>	<b>Current study, 2010 Orthopaedic Nurses (n=38)</b>
1 What percentage of women over the age of 50 will develop OP?	35%	9%	32%
4 The most serious fracture caused by OP that can be life threatening	72%	55%	61%
6 Food products (e.g. orange juice) fortified with calcium generally provides approximately how much calcium per serving?	33%	10%	13%
13 Which of the following is the best source of dietary calcium?	73%	92%	84%
16 Which of the following most accurately describes measures to prevent OP?	92%	94%	92%
19 Which of the following statements is not correct?	47%	30%	32%

### 5.2.7 Comparison with studies involving lay people

It is expected that nurses should have more knowledge regarding osteoporosis than the patients they need to educate. Despite the diversity in the studies assessing nursing knowledge of osteoporosis as well as lay people, there are several common findings. Similar mean scores to the current study was found in studies on lay women using different questionnaires but with similar questions including a study by Ailinger and Emerson (1998) with an average score of 64% using the Facts on Osteoporosis Questionnaire and a study by Von Hurst and Wham (2007) with an average score of 63% using the Osteoporosis Knowledge Test on New Zealand women. What is significant about these studies is that neither health professionals nor non-health professionals have adequate knowledge of osteoporosis which could affect their perception of their susceptibility to develop osteoporosis and their osteoporosis prevention behaviour.

### 5.2.8 Nurses role and ability to engage in behavioural changing education.

Participants in this study expressed a positive attitude regarding their role in osteoporosis prevention, viewing the role as mainly being that of preventative education, raising awareness and referring patients for bone density scans.

Participants furthermore demonstrated a very good understanding of the role of the nurse in the prevention of osteoporosis. Participants identified the essential aspects of the role as has been described in the literature (Osteoporosis Australia [OA], 2008; Radziunas, 2006; Terrio & Auld, 2002; Vered et al., 2008). Apart from the omission of falls prevention by participants in the current study, similarities between the responses of participants were found with a description of the role of a nurse in osteoporosis prevention by Vered et al. Vered suggested the role includes diverse aspects of counselling such as screening for osteoporosis, advising on healthy lifestyle behaviours, giving information on medications and supplements and prevention of falls.

Terrio and Auld (2002) suggested practitioners working with women of any age need to provide them with explicit information about osteoporosis. Although participants in this study reported health promoting activity, the outcome of this study suggests that they do not have the appropriate osteoporosis knowledge to provide accurate information. The role of the nurse in osteoporosis prevention has been described by OA (2008) as more than preventative. Nurses have a role in identifying patients at risk of developing osteoporosis and repeated low or minimal trauma fractures. Nurses therefore, should be aware of risk factors and ensure patients at risk are referred for an osteoporosis assessment. OA furthermore suggests that if adequately trained, an osteoporosis

assessment including a patient history, a bone densitometry scan, blood tests and education could be conducted by a nurse. Berarducci (2008) suggests education about risk factors, warning signs, potential complications and early intervention. Radziunas (2006) recommends enablement of nurses to assume these key roles, including enhanced knowledge and on-going professional development.

Aspects women should be counselled on include the importance of a healthy lifestyle such as abstinence from smoking and alcohol, following a healthy diet rich in calcium and vitamin D and regular weight-bearing exercises (Anders, Turner, & Wallace, 2007). However literature has identified gaps in the counselling of all women, including women with suspected osteoporotic fractures (Giangregorio et al., 2010). Similar to this, Williams et al. (2002) found that 65% of the participants in their study had not received any information about osteoporosis and the 35% who has, did not receive the information from a nurse.

Although nurses consider themselves as playing a role in counselling patients regarding osteoporosis, they do not have the knowledge or the time to engage in osteoporosis-prevention counselling. This aspect is supported by the study conducted by Vered et al. (2007) concluding that although nurses believed they have an important role in educating the public on osteoporosis prevention, their knowledge was only moderate.

Nurses working with clients at risk for developing osteoporosis should be aware of the causes of osteoporosis, the various treatments available, and the diagnosis and prevention strategies. Although participants in this study had excellent knowledge in the diagnosis and treatment categories as reflected in the responses in the questionnaire, some aspects in the prevention category reflected poor knowledge with a mean score of 57.96%.

Radziunas (2006) suggests that nurses have an integral role in facilitating the detection of osteoporosis in the various areas of contact with at risk patients including the primary care setting, emergency departments, fracture clinics, and acute and chronic wards. The majority of participants in this study perceived doctors to have the main role in the detection of osteoporosis. This is supported by a study conducted by Whitehead et al. (2004) suggesting that services often only provide bio-medically-based programs in which resources are allocated to screening and pharmacological treatment as opposed to early preventative intervention.

As stated by Berarducci (2004) nurses have the prime opportunity and major responsibility to initiate primary and secondary osteoporosis prevention education to individuals of all ages. This aspect is supported by the Nursing Council of New Zealand (2010) scope of practice for registered nurses. The scope implies that RNs use nursing knowledge and complex judgement to assess health needs and support people to manage their health. However, knowledge is essential to prepare nurses for this role.

### **5.3 Summary**

Many of the New Zealand Orthopaedic Nurse participants in this study are at risk for developing osteoporosis but have a low perception of risk which might have attributed to the inadequate level of knowledge demonstrated in this study. Nurses, however, perceive their role in osteoporosis prevention as important and identified lack of knowledge and time as barriers to osteoporosis education. Findings of this study in regards to inadequate nurses' knowledge are similar to the findings of other studies conducted amongst nursing students, registered nurses and lay women.

### **5.4 Limitations to the study.**

The relatively small sample size for this study could be seen as a limitation. Out of the 41 participants who started the questionnaire, only 38 completed section 2 regarding the knowledge of osteoporosis and 29 completed section 3 with the open-ended questions.

The choice of sampling method could have had an influence on the sample size. Due to the use of a convenience sample and the homogeneous nature of the participants (all female orthopaedic nurses), generalisation to other gender groups and other disciplines were limited.

The choice to use The Osteoporosis Knowledge Questionnaire (OKQ) is also a perceived limitation. Although this data collection tool selected was developed to assess nurses' knowledge of osteoporosis, choosing the right questionnaire that would accurately assess osteoporosis knowledge amongst New Zealand Orthopaedic Nurses presented its own limitations and may have contributed to lack of knowledge on certain aspects such as the amount of calcium in fortified foods.

## CHAPTER 6

### CONCLUSION AND RECOMMENDATIONS

#### 6.1 Introduction

Osteoporosis is a debilitating disease with epidemic proportions. The findings of this study are a call for action for nurses in NZ to become pro-active in increasing their own knowledge and awareness regarding osteoporosis in order to educate clients. Nurses are not only susceptible to develop osteoporosis; they are also in the unique position to play a major role in the prevention of osteoporosis. In the previous chapters the results of this study amongst New Zealand Orthopaedic Nurses was presented and analysed. The study was compared with similar studies amongst health professionals and compared with knowledge levels amongst lay women. In this chapter conclusions will be drawn and recommendations will be presented. The specific aims of the present study were discussed in Chapter 1, section 1.10. This study sought to explore whether New Zealand Orthopaedic Nurses have the knowledge necessary to provide osteoporosis prevention education; whether a lack of knowledge of OP is a barrier in osteoporosis prevention; and establish nurses' perception of their role in the prevention of osteoporosis and the diagnosis, treatment and education of patients presenting with a suspected osteoporotic fracture.

#### 6.2 Conclusion

Despite increased awareness of the risks of osteoporosis and multiple studies establishing knowledge of both health professionals and lay people, this study revealed gaps in the knowledge of osteoporosis amongst orthopaedic nurses in New Zealand similar to previous studies. Lack of knowledge as well as time in the acute setting has been identified as a major barrier to osteoporosis counselling. Furthermore, there is a low perception of susceptibility for developing osteoporosis among nurses older than 40 years of age. Nurses do believe they play an important role in the prevention of osteoporosis although the role is more perceived as preventative education than in diagnosis and treatment. Nurses regard the doctor as the lead in the diagnosis and treatment of diagnosis whereas their role is regarded as mainly educational. However, it has been established that nurses do not have adequate osteoporosis knowledge to effectively educate clients about all aspects of osteoporosis. Both lack of knowledge and low perceived susceptibility may have a negative impact on participants' likelihood to engage in osteoporosis-preventive behaviour and education of clients. As stated by Berarducci et al. (2000) risk factor identification and patient education are of paramount

importance in view of the prevalence of osteoporosis and nurses should take greater responsibility for increasing their own as well as client's awareness of osteoporosis.

### **6.3 Recommendations**

There is a need to raise awareness of osteoporosis at various levels, including government level. Various recommendations for the management of osteoporosis have been published, however adherence to these recommendations are random. It is suggested that New Zealand health professionals follow guidelines as recommended by Osteoporosis New Zealand (2007b).

Werner (2005) states that one of the first steps to raise osteoporosis awareness is to examine how much is known about a disease by the professionals involved in its prevention and treatment, as well as those affected by the disease. This study was limited to nurses working with orthopaedic patients and consisted of a relatively small sample size. Therefore it is recommended that this study is repeated amongst a larger group of nurses including nurses working in primary care as well as other health professionals such as allied health workers. It is proposed that addressing individuals' osteoporosis health beliefs within osteoporosis education context will improve the effectiveness of an educational program facilitating sustainable health-promoting behaviours (Sedlak et al., 2005). However, nurses in their role as health promoters could only deliver this education if they reflect on their own health beliefs and susceptibility. Campaigns to raise awareness will only be effective if nurses become aware of their own susceptibility to develop osteoporosis.

Education is believed to be the strongest predictive factor of knowledge on osteoporosis (Ziccardi et al., 2004). The use of more effective methods of providing evidence-based osteoporosis knowledge should be explored. Participants to this study have identified a study day as the preferred method to gain knowledge about osteoporosis. The establishment of a self-directed on-line learning package should also be explored.

Various questionnaires have been implemented in the numerous studies regarding the same topic, making comparison between different studies very difficult. There is a need for a single validated in-depth questionnaire tailored to assess nurses' knowledge about various aspects on osteoporosis and targeting different aspects of belief perception, age groups and gender as well as in-depth osteoporosis knowledge amongst nurses in New Zealand.

Confusion about who has to lead the osteoporosis prevention is evident and it seems nurses play a passive role. There has been a call for nurses to take a leading role in the prevention of osteoporosis. In view of the burden of osteoporosis in regards to cost, morbidity and mortality as reported by ONZ (2007a), it is time to explore the expanding of the role of the nurse in not only the prevention of osteoporosis, but also in the diagnosis and treatment of patients. Advanced nursing roles in osteoporosis such as expanded RN roles and nurse practitioner roles should be explored. Expanded roles are autonomous roles utilised in the management of health consumers with chronic conditions previously managed by other health professionals (NCNZ, 2010a), and is motivated by the need to meet health consumer needs such as the gaps identified in the prevention of osteoporosis. For the expanded roles nurses require the necessary knowledge and skill gained through on-going post-graduate education. This concept is supported by Berarducci (2004), stating the importance of nurses possessing the required knowledge base and resources to adequately educate health consumers. Berarducci suggests that nurses assume active roles in health promotion and risk reduction.

#### **6.4 Summary**

Evidence exist that osteoporosis in NZ is increasing and that there is a need for urgent action. Opportunities exist in New Zealand for nurses to enhance their role and knowledge in order to play a pivotal role in the fight against osteoporosis. Raising awareness and knowledge of osteoporosis amongst all New Zealanders is essential. Nurses are in the unique position to make a difference.

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## APPENDICES



**Multi-region Ethics Committee**

Ministry of Health  
No. 1 The Terrace  
PO Box 5013  
Wellington 6145  
Phone (04) 816 2655  
(04) 816 2646  
Fax (04) 496 2340  
Email: [mutiregion\\_ethicscommittee@moh.govt.nz](mailto:mutiregion_ethicscommittee@moh.govt.nz)

23 August 2010

Hannelie Fourie

Dear Hannelie Fourie

Study Title: Improving patient outcomes after a suspected osteoporotic fracture

Thank you for submitting an application for expedited. Upon review of your application, I can confirm that ethical approval for your study is not required under section 11.9 of the Ethical guidelines for observation studies. Your proposed study meets the exception of this clause, where ethical approval is not required for secondary use of data for the purpose of outcome analysis when under taken by those employed or contracted by the health service provider holding the information.

Please do not hesitate to contact me should you have any queries.

Yours sincerely

Claire Lindsay  
Administrator  
Multi-region Ethics Committee

## Appendix 2: EIT Research Ethics and Approvals Committee Approval



**EIT HAWKE'S BAY**

*Te Whare Takitua o Kahungunu*

Reference Number: 16/10

5 August 2010

Hannelie Fourie  
C/- Faculty of Health & Sport Science  
EIT Hawke's Bay

Dear Hannelie

Your research project *"Improving patient outcomes after a suspected osteoporotic fracture: Exploring New Zealand orthopaedic nurses' knowledge of osteoporosis and their perception of their role in the diagnosis, treatment, and education of patients presenting with suspected osteoporotic fractures"* was reviewed by the Research Ethics & Approvals Committee at their meeting held on 30 July 2010. Further information was requested. This has been received, thank you.

I am pleased to advise you that your project has been approved for a period of two years.

Please quote the above Reference Number in all correspondence with the Committee.

You are reminded that if the proposal changes in any significant way, then you must inform the Committee.

Please provide the Committee with a progress report after one year of the project and a brief summary at the conclusion.

The Committee wish you well for the project.

Yours sincerely

  
**Bob Marshall**  
Chair - Research Ethics & Approvals Committee

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### Appendix 3: Additional Information Provided to EIT Research Ethics and Approvals Committee



Te Whare Takiri o Kohungaru

27 August 2010

Hannelie Fourie

Dear Hannelie

Thank you for your letter advising of the addition of another question to the questionnaire, regarding potential participation of Maori in your study. This was tabled at the meeting of the Research Approvals and Ethics Committee meeting held on 27 August 2010.

The Committee recommend that a "Don't know" statement also be included - *True / False / Don't Know*.

The Committee wish you well for the project.

Yours sincerely

**Bob Marshall**  
Chair - Research Ethics & Approvals Committee

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## Appendix 4: Osteoporosis Knowledge Questionnaire

### 1. Socio-demographic, professional and health characteristics

The questionnaire consist of three parts. Please ensure you complete all three. Only one answer per question unless otherwise indicated. All questions have to be completed before you exit the survey. Thank you for participating in this research.

#### \* 1. Initial Registration

- RGON  
 RN  
 RCPN  
 Other

Other (please specify)

#### \* 2. Qualification/s (tick more than one if applicable)

- Master of Nursing  
 Bachelor of Nursing  
 Post-Graduate Diploma  
 Post-graduate Certification  
 Formal training in orthopaedci-related diseases  
 Other

Other (please specify)

#### \* 3. Years post-graduate experience in orthopaedics

- 1-4  
 5-9  
 10+

#### \* 4. Gender

- Male  
 Female

**\* 5. Age**

- 20-30
- 31-40
- 41-50
- 50+

**\* 6. Ethnicity**

- NZ Maori
- Cook Island Maori
- Pacific Island
- NZ European/ Pakeha
- Other European
- Other

Other (please specify)

**\* 7. Please indicate the type of facility you work in**

- Private Hospital
- DHB- Tertiary
- DHB- Secondary
- Primary Health Care
- Other

Other (please specify)

**\* 8. Please indicate your area of practice**

- Emergency and trauma unit
- Orthopaedic Outpatient Clinic
- Orthopaedic Inpatient Unit (Combined trauma and elective)
- Orthopaedic Trauma Unit
- Orthopaedic Elective Surgery Unit

**\* 9. Do you have a history of osteoporosis?**

- Yes
- No
- Don't know
- Not applicable

**\* 10. Family history of osteoporosis**

- Yes
- No
- Don't know

## 2. Osteoporosis Knowledge Questionnaire (Berarducci et al., 2002)

To explore New Zealand orthopaedic nurses true knowledge of osteoporosis, please complete this section without consulting textbooks.

**\* 1. What percentage of New Zealand women over the age of 50 will develop osteoporosis?**

- 10%
- 25%
- 50%
- 70%
- Don't know

**\* 2. Women begin to lose bone mass at what age?**

- In their 20's
- In their 30's
- In their 40's
- In their 50's
- Don't know

**\* 3. Which of the following does not increase the risk of developing osteoporosis?**

- Being a female
- Family history of osteoporosis or a hip fracture
- Smoking
- Low salt diet
- Lack of exercise
- White/Asian race
- Thin, small-boned frame
- Alcohol abuse
- Early menopause or TAH
- Don't know

**\* 4. The most serious fracture caused by osteoporosis that can be life-threatening is:**

- Wrist fracture
- Hip fracture
- Spine fracture
- Ankle fracture
- Don't know

**\* 5. What is the recommended daily intake of calcium for women aged 40-49 years who are still menstruating?**

- 800mg
- 1000mg
- 1200mg
- 1500mg
- Don't know

**\* 6. Food products (e.g. orange juice) fortified with calcium generally provides approximately how much calcium per serving:**

- 100mg
- 200mg
- 300mg
- 400mg
- 500mg
- Don't know

**\* 7. Which of the following is considered the best preserver of bone mass in women?**

- Calcium
- Estrogen
- Vitamin D
- Bisphosphonate
- Don't know

**\* 8. Osteoporosis literally means**

- Arthritis
- Increased bone mass
- Porous bones
- Senile bones
- Don't know

**\* 9. Which of the following may be a sign of osteoporosis?**

- Stiff/swollen joints
- Swollen/red joints
- Loss of height
- Shiny/stiff joints
- Don't know

**\* 10. If you use sunscreen or avoid direct sun exposure, which of the following is the recommended amount of daily Vitamin D intake needed to help absorb calcium?**

- 100-200iu
- 400-800iu
- 1000-1500iu
- 4000-8000iu
- Don't know

**\* 11. Which of the following is not an example of weight bearing exercise?**

- Dancing
- Stair climbing
- Walking
- Stretching
- Don't know

**\* 12. Which of the following medicines is used to treat osteoporosis?**

- Prednisone
- Ibuprofen
- Bisphosphonate
- Aspirin
- Don't know

**\* 13. Which of the following is the best source of dietary calcium?**

- Carbohydrates
- Green, leafy vegetables
- Proteins
- Dairy products
- Don't know

**\* 14. Currently, the most widely accepted method (gold standard) to determine whether or not someone has osteoporosis is:**

- Hip X Ray
- Bone density (DEXA) scan
- Bone scan
- Computed tomography scan
- Don't know

**\* 15. It is best to take calcium supplement tablets**

- First thing in the morning on an empty stomach
- All at once just before bedtime
- In divided doses with meals
- In divided doses on an empty stomach
- Don't know

**\* 16. Which of the following most accurately describes measures to prevent osteoporosis?**

- Taking the recommended amount of calcium daily
- Weight-bearing exercise 4-5 times weekly for 30-45 minutes
- Avoid smoking
- All of the above
- Don't know

**\* 17. Taking certain medicines for long periods of time may increase the risk for developing osteoporosis. An example of such a medicine is:**

- Prednisone
- Aspirin
- Paracetamol
- Insulin
- Don't know

**\* 18. Taking hormone replacement (estrogen) after menopause may:**

- Increase bone loss
- Decrease bone loss
- Increase fracture risk
- Decrease memory
- Don't know

**\* 19. Which of the following statements is not correct?**

- Osteoporosis is a preventable disease
- Decreasing bone mass is part of the normal aging process
- Women reach their peak bone mass in their 20's
- Osteoporosis occur in men
- Don't know

**\* 20. Once a woman begins to lose bone mass:**

- Treatment is available to minimise further loss of bone mass
- Nothing can be done to prevent further loss of bone mass
- She will develop arthritis
- She will experience hip pain
- Don't know

**\* 21. Which group of activities best describe weight-bearing exercises?**

- Walking, jogging, isometrics, stretching
- Tennis, swimming, yoga, karate
- Hiking, dancing, tennis, stair climbing
- Hiking, swimming, stretching, jogging
- Don't know

**\* 22. Which of the following is correct?**

- A person with a vertebral fracture is at increased risk for another vertebral fracture
- A person with a vertebral fracture is at increased risk for a hip fracture
- Males and females with a prior fragility fracture are at increased risk for another fracture
- All of the above
- Don't know

**23. True or false: NZ Maori has a higher incidence of Osteoporosis than Pakeha.**

- True
- False
- Don't know

### 3. Open-ended questions regarding attitudes and perceptions

**\* 1. What do you perceive to be the role of the nurse in the prevention of osteoporosis?**

**\* 2. If any, what do you see as the barriers to educating clients about osteoporosis?**

**\* 3. What aspects of osteoporosis do you want to know more about?**

**\* 4. What would be your preferred method of gaining knowledge about osteoporosis**

- On-line
- Documentation
- In-service
- Study day
- Other

Other (please specify)

**\* 5. Who is responsible for referring clients for a bone density scan (more than one answer possible)**

- Orthopaedic Surgeon
- General Practitioner
- House Surgeon
- Nurse on the ward
- Other

Other (please specify)

**\* 6. Do you think you are at risk for developing osteoporosis? Give a reason for your answer.**

**\* 7. Are you currently playing a role in promoting bone health in clients?**

- Yes  
 No  
 Not applicable

Please specify

**\* 8. If the answer in question 7 is yes, state how often and what do you do as a orthopaedic nurse to promote bone health and prevent osteoporosis in your clients?**

### Appendix 5: Age of participants and knowledge scores

Age 50* (n = 21)			Age 41-50 (n = 9)			Age 31-40 (n = 6)			Age 20-30 (n = 2)		
Total correct scores			Total correct scores			Total correct scores			Total correct scores		
Score	%		Score	%		Score	%		Score	%	
14	60.86		8	34.78		13	56.52		9	39.13	
18	78.26		13	56.52		13	56.52		14	60.86	
17	73.91		14	60.86		16	69.56	<b>Ave</b>	<b>11.5</b>	<b>50</b>	
17	73.91		13	56.52		17	73.91				
15	65.21		13	56.52		16	69.56				
16	69.56		12	52.17		15	65.21				
15	65.21		14	60.86	<b>Ave</b>	<b>15</b>	<b>65.2</b>				
17	73.91		20	86.95	Min	13	56.52				
14	60.86		17	73.91	Max	17	73.91				
15	65.21	<b>Ave</b>	<b>13.8</b>	<b>59.9</b>							
15	65.21	Min	8	34.78							
10	43.47	Max	20	86.95							
12	52.17										
19	82.6										
18	78.26										
15	65.21										
16	69.56										
19	82.6										
16	69.56										
16	69.56										
11	47.82										
<b>Ave</b>	<b>15.5</b>	<b>67.3</b>									
Min	10	43.47									
Max	19	82.6									

**Appendix 6: Place of work and knowledge scores**

DHB -T (n = 20) Total correct scores		DHB-S (n = 16) Total correct scores		Other (n = 2) Total correct scores		
Score	%	Score	%	Score	%	
13	56.52	17	73.91	18	78.26	
14	60.86	8	34.78	13	56.52	
17	73.91	13	56.52	<b>Ave</b>	<b>15.5</b>	<b>67.4</b>
15	65.21	9	39.13			
14	60.86	15	65.21			
17	73.91	16	69.56			
14	60.86	16	69.56			
15	65.21	14	60.86			
17	73.91	16	69.56			
15	65.21	18	78.26			
10	43.47	15	65.21			
12	52.17	16	69.56			
19	82.6	19	82.6			
13	56.52	16	69.56			
13	56.52	20	86.95			
12	52.17	17	73.91			
16	69.56	<b>Ave</b>	<b>15.3</b>	<b>66.6</b>		
14	60.86					
11	47.82					
15	65.21					
<b>Ave</b>	<b>14.3</b>	<b>62.2</b>				

## Appendix 7: Years' experience and knowledge level

Experience 10+ (n =20)		Experience 5-9 (n = 7)		Experience 1-4 (n = 11)	
Total correct scores		Total correct scores		Total correct scores	
Score	%	Score	%	Score	%
18	78.26	13	56.52	14	60.86
17	73.91	13	56.52	17	73.91
15	65.21	15	65.21	8	34.78
16	69.56	15	65.21	13	56.52
15	65.21	12	52.17	9	39.13
17	73.91	14	60.86	16	69.56
14	60.86	15	65.21	14	60.86
17	73.91	<b>Ave 13.9</b>	<b>60.2</b>	14	60.86
15	65.21	12	52.17	13	56.52
10	43.47	15	65.21	20	86.95
16	69.56			17	73.91
12	52.17			<b>Ave 14.1</b>	<b>61.3</b>
19	82.6			8	34.78
18	78.26			20	86.95
13	56.52				
16	69.56				
19	82.6				
16	69.56				
16	69.56				
11	47.82				
<b>Ave 15.5</b>	<b>67.4</b>				
10	43.47				
19	82.6				

**Appendix 8: Qualifications and knowledge of osteoporosis**

BN (n = 11)			Pg Cert/Dip (n = 15)			Masters (n = 4)			Other (n = 4)			Ortho (n = 4)		
Total correct scores			Total correct scores			Total correct scores			Total correct scores			Total correct scores		
Score	%		Score	%		Score	%		Score	%		Score	%	
17	73.91		13	56.52		18	78.26		17	73.91	RGON	17	73.91	
8	34.78		14	60.86		15	65.21		15	65.21	RGON	14	60.86	
9	39.13		13	56.52		10	43.47		15	65.21	DipN	12	52.17	
16	69.56		16	69.56		17	73.91		16	69.56	RGON	16	69.56	
18	78.26		13	56.52	Average	15	65.2	Average	15.75	68.5		Average	14.75	64.1
13	56.52		14	60.86	Min	10	43.47	Min	15	65.21		Min	12	52.17
13	56.52		14	60.86	Max	18	78.26	Max	17	73.91		Max	17	73.91
12	52.17		17	73.91										
14	60.86		15	65.21										
11	47.82		19	82.6										
15	65.21		15	65.21										
Average	13.3	57.7	16	69.56										
Min	8	34.78	19	82.6										
Max	18	78.26	16	69.56										
			20	86.95										
			Average	15.6	67.8									
			Min	13	56.52									
			Max	20	86.95									